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MARCH 1961

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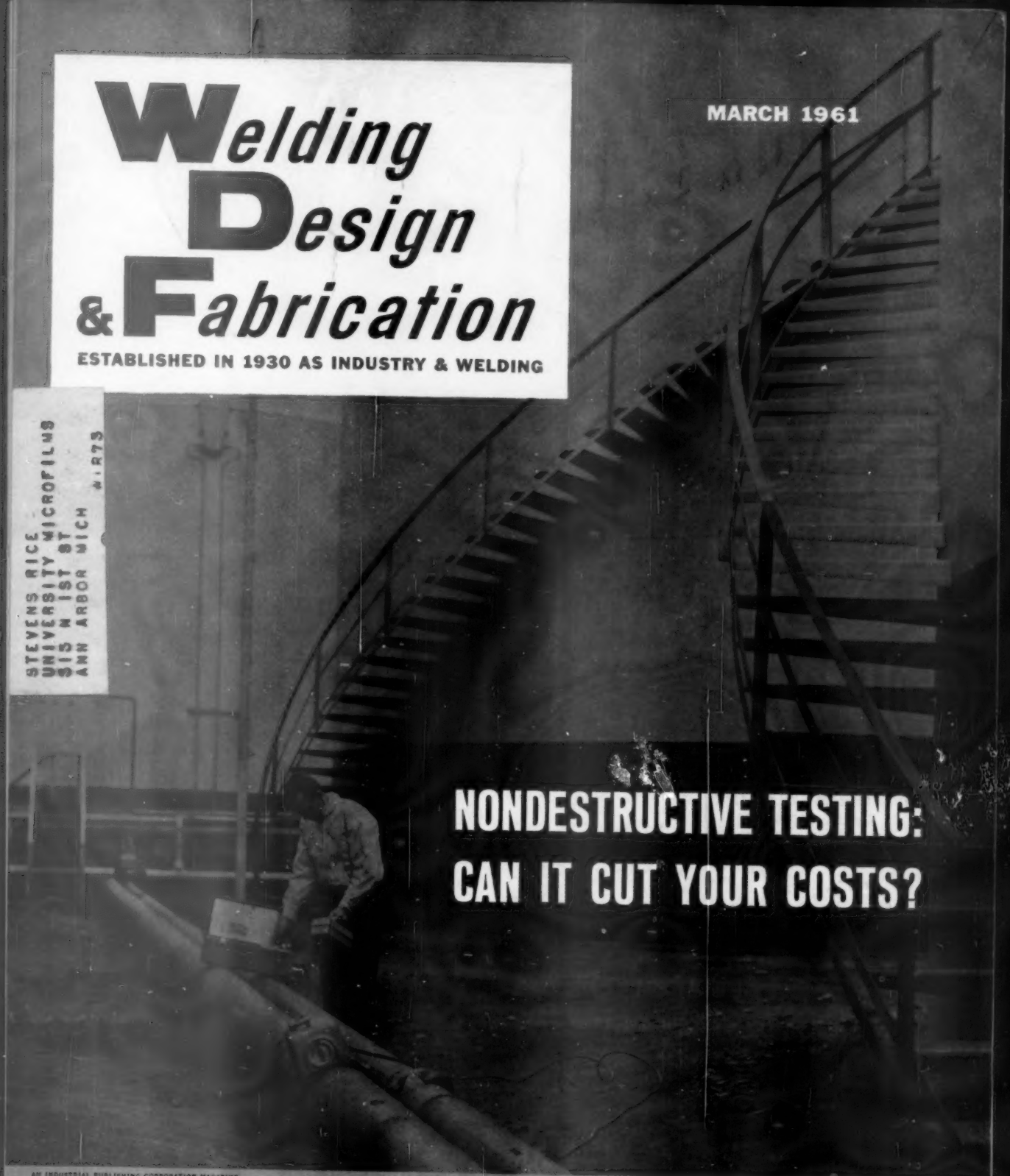

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AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

ALSO IN THIS ISSUE

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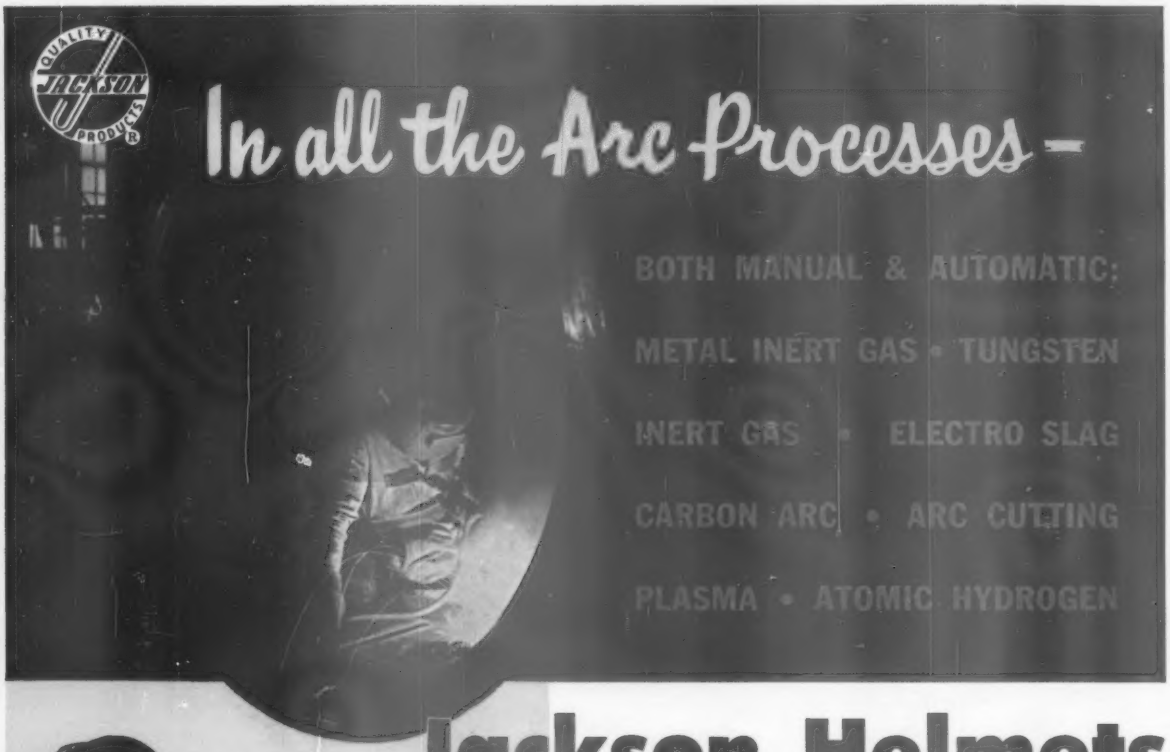
ARE YOU BUYING TOO MUCH WELD METAL?

WHAT DO YOU REALLY KNOW ABOUT WELDING CODES AND SPECS?



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Shown: non-conductive plastic holder.

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Shown: non-conductive plastic holder.

H-80AP

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H5-A

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Right: All Jackson Helmets may be bought in combination with any of three Jackson safety caps. Great comfort, greater safety.

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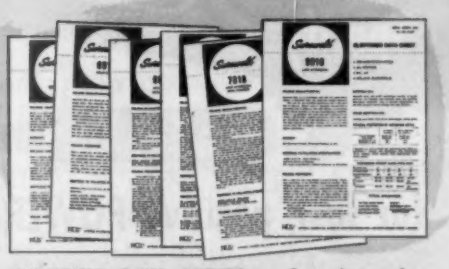

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reader's guide to

for March, 1961

COVER: A lightweight and portable gamma inspection unit that weighs less than 50 lb. is used here to inspect welds in a 12-inch diameter, ⅜-inch wall petroleum pipeline. The equipment is Picker X-Ray Corporation's Pipeliner which uses a 30 curie Iridium 192 power source. A report on how nondestructive testing saves time and money starts on page 51.

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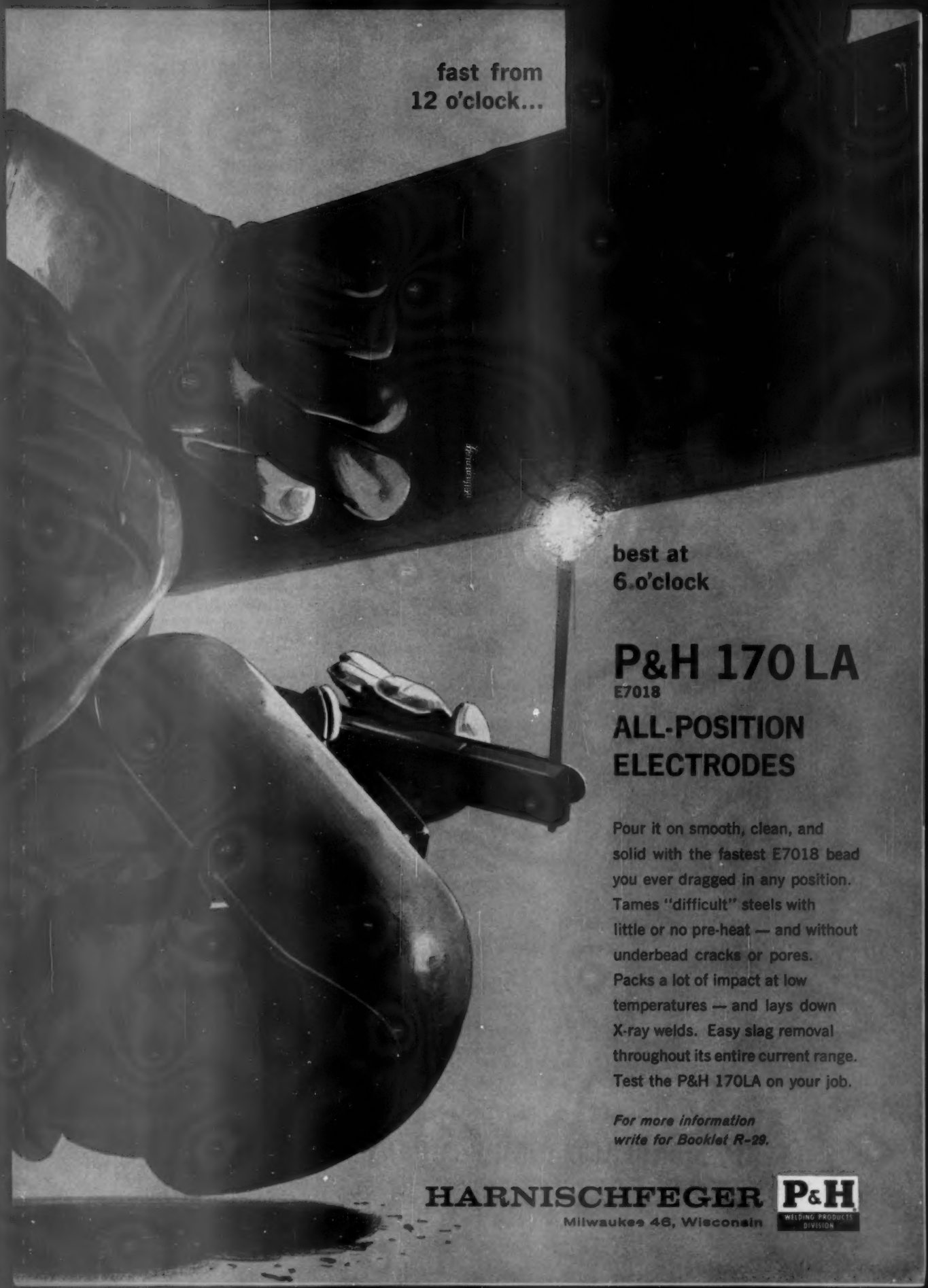
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It was tested on pipe line construction by Humble Pipe Line Co., an affiliate of Standard Oil Co. (New Jersey).

The automatic welder is placed over the butted ends of the pipes to be joined. The pipes are held in place by clamps and aligned by special internal aligning clamps. The machine revolves around the pipe twice; while an abrasive wheel prepares the pipe ends for welding. Then the machine arc welds the pipes in two passes. These four operations take only one minute on 8-inch pipe. This is said to be 20 times faster than manual welding.

After welding, the internal aligning clamp is collapsed and removed to the next joint.

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LIBRARY

of welding

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Copies of AWS Definitions (including desk chart of processes) may be obtained for $2.00. Copies of the wall process chart or the desk process chart may be obtained separately for $1.50 and $.50, respectively. Write the American Welding Society, Dept. T, 33 West 39th Street, New York 18, New York.

The availability of a new revision of *Standard Welding Terms and Their Definitions* has been announced by the American Welding Society. It is the first revision in 12 years; many changes have been incorporated and much new material added.

A new *Master Chart of Welding Processes* has been prpeared in conjunction with the definitions. The 39 recognized welding processes are presented in a new layout designed for ready reference. Colors are used for the first time to separate the various processes. This provides instant identification. The master chart is available in 2 sizes; and 8½-by-11 inch for desk use and a 22-by-28 inch for wall use.

50 Years in Industry

"Million Dollar Bend," Williams-Frederick Press, 391 East 149th Street, New York City, or Eisler Engineering Co., Inc., 760 South 13th Street, Newark, N. J., 315 pages, $4.75.

This is the autobiography of Charles Eisler, M. E. and D. Sc., chairman of the board, Eisler Engineering Co., Inc., Newark N. J. It is a highly readable human document that follows the life of a young Hungarian boy from his initial experiences in America at the turn of the century, through to the founding and operation of the company that has borne his name for 40 years.

The book gives a lively account of the personal and business hurdles Dr. Eisler had to jump during his career. It discusses his long list of inventions in the radio and lamp industries. In fact, the title of the book comes from the patent covering Dr. Eisler's original bent-tube exhaust method for mass producing tipless stem incandescent lamps.

The book has an extensive appendix that is illustrated with photographs and drawings of many of Dr. Eisler's early machines.

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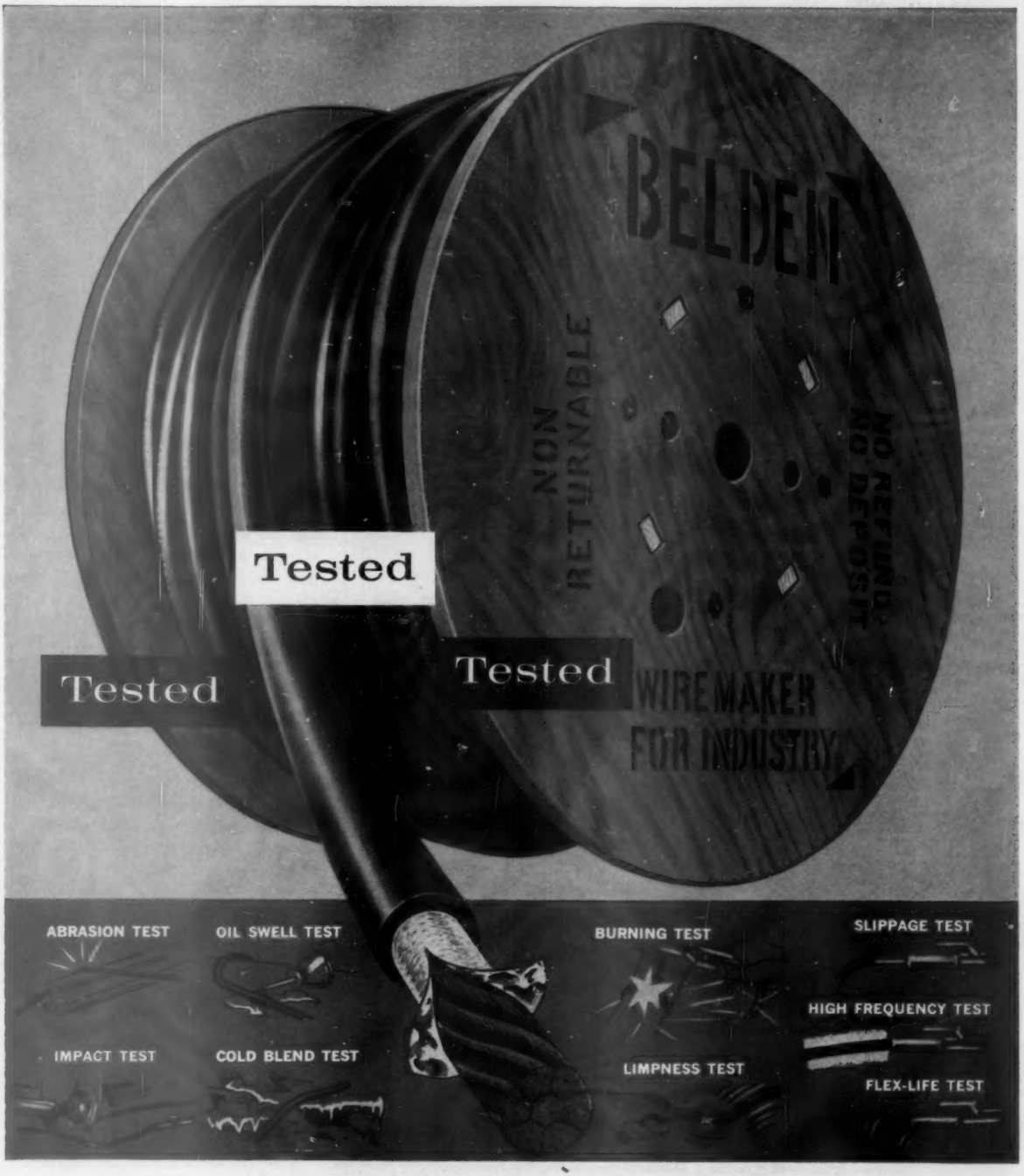

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LIBRARY OF WELDING

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AWS Bibliographies

"1960 Supplement to AWS Bibliographies" may be obtained from the American Welding Society, Technical Department, 33 West 39th St., New York 18, N.Y., $1.50.

The 1960 Supplement to the American Welding Society Bibliographies is now available. The original publication contained bibliographies of articles published in the WELDING JOURNAL from 1937 through 1957. Each year a Supplement is compiled listing the previous year's articles.

The Bibliographies previously issued listed articles under 28 subject headings. The current Supplement contains listings of all articles appearing in the Welding Journal from January through December, 1960.

The Supplement has been designed for use as-issued or as supplementary material to bring previous Bibliographies up-to-date. The format is identical and entries under a given subject are contained on one or more pages. Each page is punched to facilitate insertion into the original Bibliographies under the respective subject heading.

Welding Developments

"New Developments in the Welding of Metals" (DMIC Report 131) by P. J. Rieppel, Defense Metals Information Center, Battelle Memorial Institute for Office of the Director of Defense Research and Engineering. June, 1960. 50 pages. Order PB 151 089 from OTS, U. S. Department of Commerce, Washington D. C., $1.25.

The useful applications and limitations of 14 industrial welding techniques developed since 1956 are surveyed under these four categories: Fusion welding, resistance welding, high-temperature brazing, and solid-state bonding. The report explains how each technique in these four groups works and comments on the effectiveness of various applications of each.

Fusion welding techniques evaluated are electroslag, short-arc, dip-arc, electron beam, and arc spot welding.

Resistance welding techniques reviewed are high-frequency, foil seam, and magnetic force welding.

High-temperature brazing techniques are heavy-section, thin-section, and special brazing.

Solid-state bonding processes reviewed are diffusion bonding and ultrasonic, explosive, and friction welding.

Press Brake Die Book

"Press Brake Dies" is published by Dreis & Krump Manufacturing Company, 7400 S. Loomis Blvd., Chicago 36, Illinois; price is normally $3.00, but book is available free to any press brake user if requested on company letterhead.

This new book on press brake dies has 134 pages divided into 11 sections. It gives a comprehensive treatise on the design and applications of the different bending and forming dies and punching units for press brakes. A complete table of contents and section indexed permit quick reference to dies for any particular bending, forming, and punching operation.

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A standard Arc-Fit with easily interchangeable dies (one for each contour) notches pipe ranging up to 2" O.D.; or tubing up to 2½" O.D. Special Arc-Fits are available for larger sizes, angles other than 90°, slotting, notching square pipe and for angle iron or flat stock.

Ask for literature. For quotation send sample or drawing of part.

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FOR STRENGTH WELDS AND WEAR RESISTANCE!

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11%-13½% MANGANESE-NICKEL STEEL

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...are "SOLID-STATE" electrodes
...all six vital alloying elements are in the steel core — none are in the flux coating.

MANGANAL FLO-KOTE ELECTRODES...

...assure solid joint-welds of unbelievably high strength and toughness.
...provide surfaces of remarkable resistance to erosion and shattering impact.

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Nearest Distributor Upon Request. Send for Helpful Literature.

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Aluminum and Magnesium

"Elevated Temperature Properties of Aluminum and Magnesium Alloys (STP 291)" is published by the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Penna.; 308 pages, paper cover, 8½-by-11 inches; $7.00.

This publication summarizes elevated temperature, tensile, and creep rupture properties of current commercially-established aluminum and magnesium alloys which would normally be used at elevated temperatures. The material included constitutes elevated temperature data of the type used in determining allowable stresses for the Unfired Pressure Vessel Code of the ASME Boiler Code Committee. Every effort was made to cover those alloys used in the airture applications. Both wrought and cast alloys are covered in various craft industry for elevated temperaforms.

The book is arranged for easy reference. A complete table of contents, along with a comprehensive introduction, helps guide the reader. Title sheets for each alloy give the alloy designation, chemical composition, and the pertinent specifications under which various forms of the material are supplied. The Data Sheets for each alloy give a description of the material and the strength values for the mechanical properties.

On the graphs, a consistent set of code symbols has been used, where practical, to distinguish types of products, test temperatures, and other variables.

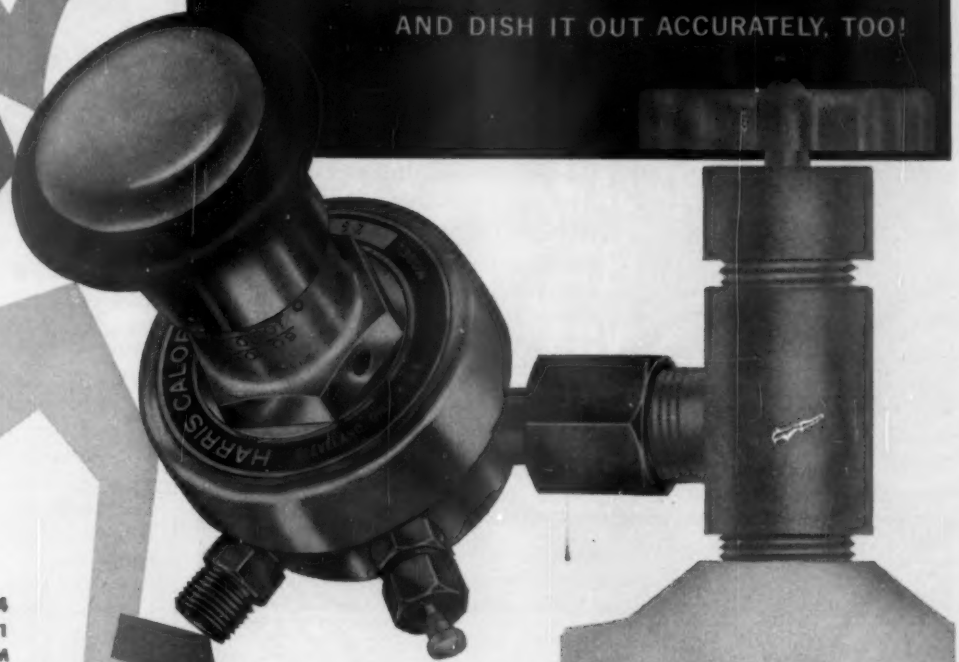
Grinding Wheel Standard

"American Standard Specifications for Standard Shapes and Sizes of Grinding Wheels, B74.3-1960." Grinding Wheel Institute, 2130 Keith Building, Cleveland 15, Ohio, no charge.

The Grinding Wheel Institute has issued this new publication as a result of approval by the American Standards Association of new ASA standard specifications for shapes and sizes of grinding wheels. These new standards classify, according to 12 end-use categories, the shapes and sizes of grinding wheels which are considered standard by industry. It replaces a prior publication "Standard Shapes and Sizes of Grinding Wheels, Simplified Practice Recommendations, R45-57."

HERE'S A NEW REGULATOR THAT CAN TAKE IT!...

AND DISH IT OUT ACCURATELY, TOO!



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NEW YORK COLISEUM

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APRIL-NATIONAL WELDED PRODUCTS MONTH

Knock it, bump it, drop it, kick it . . . you can afford *not* to be careful with Harris Model 29 *Gaugeless* Regulators. And yet, while you attempt to avoid such treatment, nevertheless the 29 Gaugeless assures you trouble-free performance . . . reads more accurately than most two-stage gauge-less regulators!

Here's why:

- ***Working pressures*** deeply embossed in the bonnet are easy to read—calibrated at 10 lb. intervals for Oxygen; 2 lb. intervals for Fuel Gas.
- ***Cylinder content indicator*** is calibrated at ¼-cylinder graduations, from full to empty... is built snugly within the protective circle of the cylinder's circumference.
- ***No exposed slots*** in the bonnet . . . impossible for dirt and moisture to reach pressure spring and moving parts.
- ***Tamper-proof*** safety built within the regulator.

MODEL NO.	TYPE	DELIVERY RANGE	CU. FT./HOURS MAXIMUM FLOW	CGA CONNECTION
29	Oxygen	0-100	1600	540
29-P	Acetylene	0-15	@ 15 lbs. 350	510
	Propane	0-26	@ 26 lbs. 400	
29-D	Acetylene	0-15	@ 15 lbs. 350	Alt. 300
	Propane	0-26	@ 26 lbs. 400	
29-ER	Carbon Dioxide	0-26	400	320

Low Price $24.00

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For more information regarding the Harris line of 29's, write The Harris Calorific Company

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MEN ON THE MOVE

in the welding industry

PROMOTIONS:

MASTERN

KUNKLER

William W. Mastern is regional sales manager for Beaver Pipe Tools, Inc., Warren, Ohio.

L. W. Kunkler has been appointed district manager or Air Reduction Sales Company's Buffalo office. He is succeeded in Cleveland as assistant manager-engineering services by **H. D. Mann.** At the same time Airco appointed two other district managers: **J. W. Cunningham** in Pittsburgh and **R. W. Merriman** in Philadelphia.

Henry H. Hemenway is vice president for research and engineering and **Lionel G. Lancaster** vice president for construction at Graver Tank and Manufacturing Co., a division of Union Tank Car Co.

John K. Light has been named to assist **J. E. Norcross,** executive vice-president at Arcos Corp., Philadelphia.

Ohio Nut and Bolt Company, Berea, Ohio, has reorganized its sales department into three regions. Each region will have a sales manager and an account specialist. They are: Northeast and East Central, **C. R. Green,** sales, and **D. R. Clarke,** specialist; North Central, **G. F. Nolan,** sales, and **D. J. Lesko,** specialist; and Southern, Southwestern and Western states, **F. H. Lowry,** sales and **C. F. Frobieter,** specialist.

H. C. Webb is district sales manager of Haynes Stellite Company's Central District. He succeeds **F. P. Shephard** who has retired.

continued on page 18

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A MAJOR TECHNICAL ADVANCEMENT

EPA 7000-4

AC and DC ARC WELDING from 3 PHASE INPUT

VICKERS Controlarc®

Vickers research and development of new and better welding apparatus has again culminated in another Vickers "first" in the welding industry . . . Now, the only AC-DC Arc Welder designed to use three-phase input power for both AC and DC output . . . The Controlarc 330.

The advanced features of this new machine are enhanced with a full complement of standard Controlarc accessories, which provide: correction for line voltage variation, full range foot rheostat tapering of welding current, dual-continuous control. Vickers slope controller provides automatic DC or AC current programming over the full range of the machine.

Call your Controlarc welding dealer or write for complete information.

Welding Dealers: Some territories available—visit our booth at the AWS Show.

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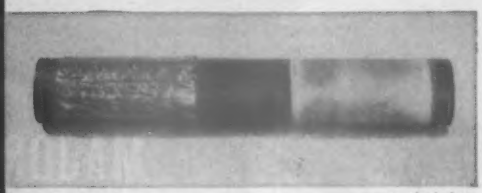
Division of Sperry Rand Corporation
ELECTRIC PRODUCTS DIVISION
1855 LOCUST STREET • SAINT LOUIS 3, MISSOURI

HARD FACING TIME CUT FROM 4 HOURS TO 25 MINUTES

The two end sections of this shaft have been built up with AMS 4775. Section at left applied by welding — time 4 hours; section at right by flame spraying — time 24 minutes, 45 seconds.



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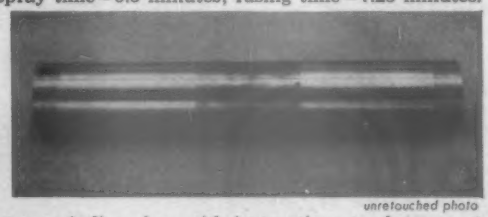
QUESTION: And which end would you prefer to grind finish?

Here's the whole story. We took a 15" length of 2.5" mild steel shafting and undercut two 5" sections .050" on the radius. We then sent the shaft to a nationally-known job shop with instructions to apply AMS 4775 on the left-hand section, sufficient to finish at 2.5". Weight of welded-on alloy was 17 9/16 ounces — time spent by one of their top men — 4 hours (including preparation).

Then we blasted the second section with steel grit and flame sprayed it with AMS 4775 in powder form (ThermoSpray Powder 15E). The coating was then torch-fused. Weight of deposited alloy — 11 1/16 ounces; surface preparation, set-up and pre-heat — 12 minutes; spray time — 5.5 minutes; fusing time — 7.25 minutes.

Finish-ground shaft — welded section at left, flame sprayed section at right.



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We then sent the shaft out to a grinding shop with instructions to clean up at 2.500" plus. The flame-sprayed section cleaned up at 2.510" but welded section still showed pits when grinding was stopped at 2.477" (see photos below left). Rockwell of welded end Rc-61, sprayed end Rc-60.

Note pits in welded section at left. Both magnified about 50x.

These flame-sprayed coatings are solid, homogeneous; usually superior to those applied by other methods. You can apply them at high speed, with lower material and finishing costs. In addition to AMS 4775, a number of other powders — including tungsten carbides — are available for various service requirements; all may be fused—some used as sprayed for certain service requirements.

For further information on this high-speed, money-saving, hard-facing process, phone, write or wire.

Pump plunger being flame sprayed with METCO ThermoSpray Powder Gun

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FORMERLY METALLIZING ENGINEERING CO., INC.
Flame Spray Equipment and Supplies

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Company
Address
City Zone State

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MEN ON THE MOVE

continued from page 16

PROMOTIONS:

Eugene M. Rutt is the new general sales manager at Rankin Mfg. Company, Alhambra, California. Mr. Rutt has been with Rankin for the past nine years. When he started with Rankin he covered the entire Pacific Coast and Western Canada. More recently, he represented Rankin in the Northwestern States and in Western Canada.

H. Y. Martindill is general manager of United Specialties, Inc., El Dorado, Arkansas.

The Austin Company, Cleveland, has named **Louis O. Schaefer** works manager of its Steel Fabricating Division. He succeeds **Loren C. Miller,** who has been named assistant manager of the Chicago District.

R. B. Hazard is vice-president-sales for the Industrial Rubber and Mechanical Packings Divisions of Raybestos-Manhattan, Inc., Passaic, N. J. **J. F. D. Rohrbach** is sales manager.

Two men have been appointed to positions in the newly established Industrial Engineering Department of Graver Tank & Mfg. Co., East Chicago, Ind. They are **Alan Law,** chief industrial engineer, and **R. W. Briska,** plant engineer. **E. G. Vial** was named plant manager at Houston.

Two assistant directors at metals research have been named at Armour Research Foundation, Chicago. They are **Harry Schwartzbart** and **Ray J. Van Thyne.**

W. L. Farmer, regional manager of the RegO Division of Bastian-Blessing Company, Chicago, will now have supervisory responsibility over the Division's Kentucky territory. **George A. Workman** will be district sales manager for Kentucky, Michigan, Indiana, and Western Ohio.

continued on page 20

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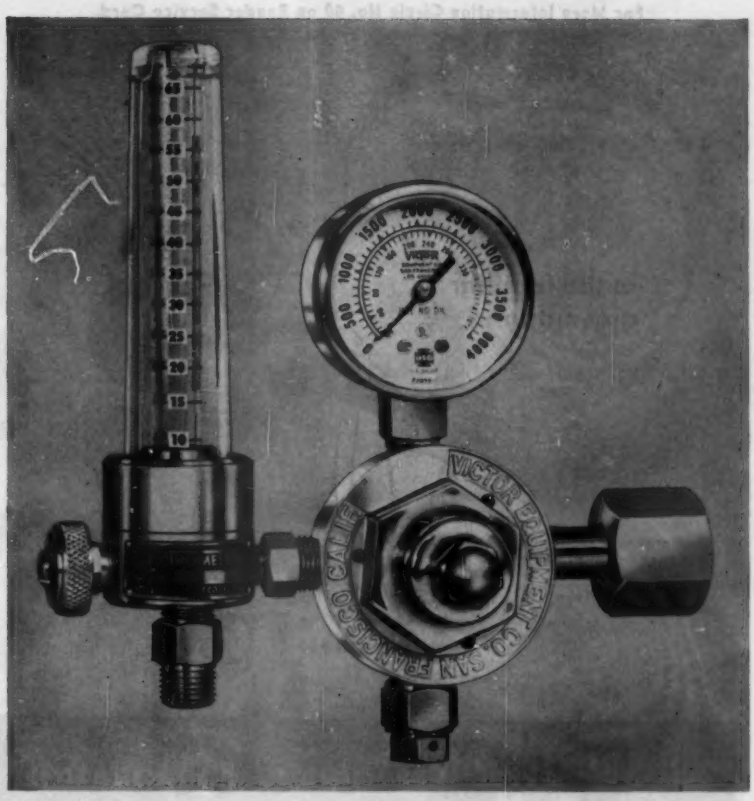
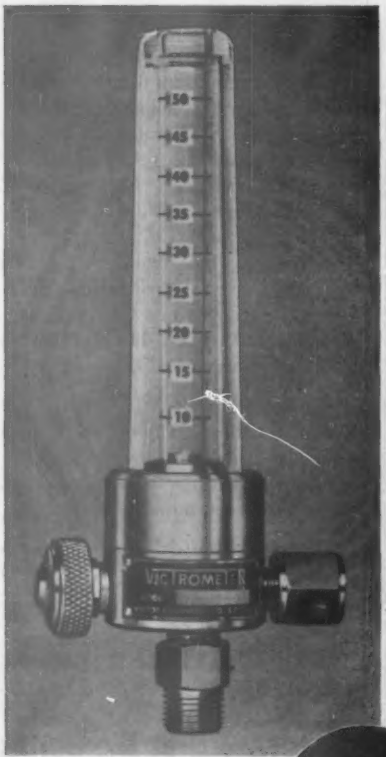
REGULATORS & VICTROMETERS
control and measure

argon • helium
nitrogen • hydrogen
carbon dioxide • air
dissociated ammonia

Especially suited for gas shielded arc welding and laboratory work





COMBINATION TWO-STAGE REGULATOR-VICTROMETER
For applications requiring constant delivery flow over a range of decreasing cylinder pressure.

COMBINATION SINGLE-STAGE REGULATOR-VICTROMETER
For applications where a slight delivery flow increase due to decreasing cylinder pressure is not an important factor.

VICTROMETER
Models for use on regulators or distribution line stations.

Non-compensated type operates on a range of inlet pressures of 10 to 100 psi for a variety of applications where back pressure is not a factor.

Compensated type (50 psi) used with pre-set regulators and distribution lines accurately set at 50 psi. Constant pressure offsets back pressure from the outlet line.

Design features. Choice of 3 flow ranges for each gas, also combinations — argon/helium on same tube. Simple design permits quick change of tube and float for different gases and flows, plus ease of service. Tube and indicator float visible from all sides. Accurate adjustment with finger-tip controlled needle valve.

Thousands of Victor regulators and Victrometers are now in everyday use. For full details, including flow ranges for all gases listed, see your Victor dealer, or write us for Bulletin RV-2.

77

Mfrs. of high pressure and large volume gas regulators; welding and cutting equipment; hardfacing rods; blasting nozzles; cobalt and tungsten castings; straight-line and shape cutting machines; roller and idler rebuilding machines.

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Robvon's Commercial Backing Rings are designed for quick easy alignment of pipe or tubing and assure precise close tolerance fit-up. Robvon Backing Rings allow complete penetration and fusion of the weld. Robvon Backing Rings radiograph perfect certified welds. The patented nubs automatically set the welding gap for the root-pass. The internal bevel and flat inner land assures non-restricted fluid flow.

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MEN ON THE MOVE

continued from page 18

APPOINTMENTS:

OPPENHEIM

SHRYROCK

C. E. Oppenheim is new Midwestern regional manager for Alloy Rods Company. His headquarters are in Chicago.

Donald E. Shryrock has been named field representative for the Arcair Company, Lancaster, Ohio. He will cover the Midwest.

J. B. Nottingham & Co., Inc., has named **Richard H. Snyder** manager of its Middle Atlantic region with headquarters in Glendale, Pa., a Philadelphia suburb.

The Grinding Wheel Institute has appointed committees for 1961. Heading these are: Packaging, **H. D. Leitten,** Electro Refractories & Abrasives Corp.; public relations, **D. S. Saurman,** Simonds Abrasive Co.; research projects, **W. L. Kenagy,** Simonds Abrasive Co.; safety, **F. C. Stockinger,** Bay State Abrasive Products Co.; standardization, **H. J. Jeffers,** Carborundum Co.; and technical committee, **H. D. McMaster,** Keystone Abrasive Co.

Wesley F. Fisk, Jr. has joined Kenco Welding Supplies of Cupertino, Calif. He will handle sales in northern California, southern Oregon, and western Nevada.

Charles R. Eddy handles sales in the east coast territory from Maine to Virginia for Sellstrom Mfg. Co., Palatine, Ill.

William J. Fisher is sales manager of the Berkeley Company, Danville, Illinois.

Louis J. Bauer has been named field engineer at Norton Company's St. Louis district office. He will be succeeded in Memphis by **Donald F. Clair.**

continued on page 22

This New **PLUG-IN** Welder Control

Lets You

ADD CONTROL FUNCTIONS AS YOU NEED THEM

A Wide Range of Plug-In Units Enables You to Add Components as Your Welding Jobs Change

HERE'S HOW YOU CHANGE YOUR BASIC CONTROL SIMPLY BY ADDING PLUG-IN UNITS

FOR WELDING MILD STEEL— BASIC CONTROL INCLUDES THESE PLUG-IN UNITS:

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YOU ADD THESE PLUG-IN UNITS:

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Every feature you want —for every welding job

- **22 standard units provide "custom" control for every welding requirement**
- **all units are plug-in type for quick change**
- **available in "all electronic" or "relay firing" versions**
- **auxiliaries for all conventional welding functions**
- **circuits include the latest safety features**

Write for Bulletin SM-277 to Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin

SQUARE D COMPANY

wherever electricity is distributed and controlled

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TUFFALOY forged seam welder wheels provide the utmost in conductivity and long life. Photo by Taylor-Winfield Corporation.

TUFFALOY FORGINGS

Fault-Free and Right on Spec

To carry the current they should and withstand the pressure they must, resistance welding alloy parts have to be right on specification both as to composition and structure.

RWMA specification forgings by TUFFALOY are used for seam welder wheels and shafts, butt and flash welder dies, and welding platens. TUFFALOY's more than twenty-five years in producing these forgings have led to the establishment of the largest stock of forged bars and wheels anywhere.

For fault-free forgings—wheels (finished or unfinished), square or rectangular bars, and special shapes of all kinds, all heat-treated or cold-worked to maximum hardness, specify TUFFALOY.

TUFFALOY alloys are semi-continuously cast into twenty-foot long billets for greater uniformity of structure.

Forging the desired shapes from heated segments of TUFFALOY billet under a steam hammer takes rare old-world skill.

Doc Tuffy says . . . to make sure every TUFFALOY forging meets hardness requirements, every forging is tested individually. TUFFALOY people will always go a step further to maintain product superiority.

Write or call your nearest AIRCO or TUFFALOY distributor. Ask whether your forging needs are now in stock. Ask him too for the TUFFALOY catalog . . . it makes correct alloy and tip specifications easy.

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MEN ON THE MOVE

continued from page 20

ELECTIONS:

AUGUR

SEDAM

Lewis G. Blessing, president of Bastian-Blessing Co., Chicago, has been elected chairman of the board. He is succeeded by **Allison L. Augur,** formerly executive vice president.

M. G. Sedam is newly elected president at Alloy Rods Co., York, Penna. He succeeds **Edward J. Brady,** who becomes chairman of the board. **G. M. Hohmann** succeeds Mr. Sedam as executive vice president.

Ralph F. Gow was elected president of Norton Company at the company's recent 76th annual meeting. He succeeds **Milton P. Higgins,** who becomes chairman of the board.

L. D. T. Berg, manager of Air Reduction Sales Company's Equipment Marketing Division, has been elected chairman of the Arc Welding Section of the National Electrical Manufacturers Association. He is succeeded by **M. G. Sedam** of Alloy Rods Co.

AWARDS:

Charles W. Lytton, Pittsburgh district manager for Lincoln Electric Co., has been named "District Manager of the Year" by **William Irrgang,** Lincoln president. He was cited because his district had produced a 19% increase in sales over 1959.

DEATHS:

William Finneran, Chicago district sales manager of A. O. Smith's Welding Products Division, died recently at his home.

For Summer Time...
For Any Time...

AO Lightweight
Welders' Clothing!

- Comfortable
- No Surplus Weight

These very comfortable garments of lightweight leather are recommended for welders working on gas shielded electric welding where Argon, Helium and similar gases are used. They should not be used for protection against sparks in electric arc welding.

CAPE SLEEVE WITH DETACHABLE BIB (C208B)

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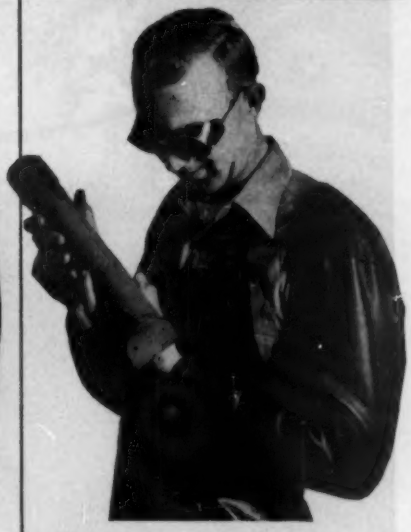
NOT ILLUSTRATED — SHORT JACKET (C203). Jacket is 18" long.

26" COAT (C206)

For welders who prefer to weld in a very lightweight jacket. Seams are double thread sewed. Snap fasteners down front. Snap fasteners on each sleeve for snug fit (nickel plated for heat reflection). Pocket also has snap fastener for security.



SLEEVE 18" INSEAM LENGTH (C209)

Double thread sewed seams, snap at cuff. Leather thong around neck holds sleeve secure. The lack of unnecessary weight pays off in greater comfort, added efficiency, better welding.

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Your Surest Protection...AO SURE-GUARD Clothing

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WELDING MANAGEMENT

watches these developments

A GENERAL PRICE REDUCTION on its line of welding machines, electrodes, and supplies has been announced by Lincoln Electric Co. Individual price reductions range up to 12.5 percent. William Irrgang, president, says the action was taken at this time to help users of arc welding equipment meet the challenges of competition and rising costs. He said this reflects Lincoln's policy of setting prices according to its manufacturing costs and reducing those prices as costs are reduced.

GENERAL ELECTRIC PUTS 40 YEARS' EXPERIENCE IN EVERY TUNGSTEN ELECTRODE

When you order tungsten electrodes from General Electric, you're dealing with the world's largest, most experienced manufacturer of quality tungsten products. Ask your welding supplies distributor for any of these G-E electrodes: **1. Hi-Purity Tungsten. 2. 1% Thoriated Tungsten. 3. 2% Thoriated Tungsten.** All are color coded for your convenience and available with either a cleaned or ground finish. Need more information? Write: General Electric Co., Lamp Metals & Components Dept. WDF-31, 21800 Tungsten Rd., Cleveland, O.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For More Information Circle No. 30 on Reader Service Card.

A NEW WELDING LABORATORY has been placed in operation at International Nickel Company's Huntington Alloy Products Division, Huntington, W. Va. The new 4,000-square-foot, $200,000 laboratory represents a second major expansion of the Division's laboratory department within the last two years: A $1,500,000 construction and equipment program was completed last spring. Most of the research to be conducted at the new lab will be in the nuclear power field.

IN THE 25 YEARS since steel replaced wood for automobile frames and wheels in a revolutionary fabricating development, new generations of specialty steels have quietly assumed a major role in improving the performance and appearance of the modern automobile, according to Clyde G. Davies, vice president and general manager of Armco Steel Corporation's Armco Division.

"Specialty steels should grow rather than decrease in importance to the automotive industry despite the contributions and challenges presented by other materials," Mr. Davies said.

HOW THEY MEASURE AND MEET public tastes in cars will be explained by leading automobile company executives at the Design Engineering Conference at Cobo Hall, Detroit, May 22 through 25. The panel session will have top engineers and sales executives of Ford, Chrysler, General Motors, and American Motors as participants. They will describe how their companies determine what the public wants, how engineering departments design components at minimum costs, and how the production departments produce these parts.

(Editor's Note: The May issue of WELDING DESIGN & FABRICATION *will cover the Design Engineering Conference completely, featuring exhibitors, speakers, and other activities. That issue will also include statements from leading designers on how welding has affected the design of products for their particular industry.)*

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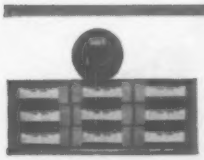

Cartons and spools both have new labels

Both the grade and color-coded stripes are printed on coil liners

New labels are on sides of Payoffpaks and Leverpaks

• For the first time, you can purchase all your automatic welding wire with permanent, color-coded identification. A new labeling system plus specially printed packages helps simplify inventory control, does away with scrap loss due to lack of identification.

Each label, in addition to its color code, shows complete information on grade, size, heat number, weight, and your order number. A typical label for reels is shown above—as the grades of wire change, so do the color combinations. PAGE'S new system is the first comprehensive color identification program in the industry.

WRITE US at Monessen, Pa. for new pocket-sized color-code identification card plus new welding wire comparison chart

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For More Information Circle No. 55 on Reader Service Card.

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New automation techniques put responsibility for precision manufacture of Morgan equipment in the hands of skilled technicians . . . plus exacting, efficient production facilities.

This 135-ton milling and boring machine, for example, handles giant weldments with new speed and ease . . . but maintains the extreme accuracy we demand for all components of Morgan-built equipment. An interesting feature is a television screen that lets the operator read vernier scales on a lower level without leaving the control platform.

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Inspection of the Morgan plant is welcomed. Write, wire or phone for complete data on facilities . . . or ask a Morgan sales engineer to call.

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MARCH, 1961
Welding Design & Fabrication
ESTABLISHED IN 1930 AS INDUSTRY & WELDING

AN INDUSTRY PROBLEM

The welding industry needs more graduate welding engineers

says
Prof. Roy B. McCauley, head of the Welding Engineering Department, Ohio State University

IN BRIEF: The current demand for graduate welding engineers is greater than can be met. Here's how Ohio State University's Welding Engineering Department is working with the welding industry to solve this problem.

"THERE IS A TREMENDOUS DEMAND today for graduate welding engineers."

That's what Prof. Roy B. McCauley told WD&F editors during their recent visit. He's chairman of the Welding Engineering Department at Ohio State University's College of Engineering. This department was established in 1948, accredited by the Engineering Council for Engineering Education in 1955, and is one of two in the world that grants degrees. The other is Japan's Osaka University. So far, the Department has granted 120 degrees.

"This demand for graduate welding engineers is so great," Professor McCauley told us, "that one company today would hire every one of our present 35 students immediately on graduation. Yet most high school students and many students in our College of Engineering are unaware of the tremendous opportunities in welding engineering. Getting this message across is one of our biggest jobs."

Professor McCauley feels the best publicity for welding engineering would be for Ohio State to develop a big enrollment in its Welding Engineering Department. This in turn would spark other colleges and universities to open welding departments for their students. But, big enrollment will not come easy.

PUBLICIZE WELDING ENGINEERING

OSU's Welding Engineering Department is producing a movie to tell junior and senior high school principals, teachers, and students about job opportunities. This will point students down the track

continued on page 28

Scholarships at Ohio State are helping students learn

TOM DEMPSEY, publishing director of WD&F (right), presents a scholarship check to Roy B. McCauley, chairman of Ohio State University's Welding Engineering Department. The Scholarship was established in honor of the late Irving B. Hexter, W&DF's founder.

PROFESSOR McCAULEY discusses a welding problem with James W. Bradley (right), a fourth year student in welding engineering and the first winner of the National Cylinder Gas Scholarship in Welding Engineering. A second NCG scholarship winner will be announced shortly.

toward a welding engineering education. The movie will cost $10,000. It is being paid for by the National Welding Supply Association.

This publicity is important because the Welding Engineering Department gets little chance to interest students once they have enrolled in OSU's College of Engineering. The department gets only one hour each year to talk to students in the pre-engineering freshman and sophomore years—along with 20 other engineering career groups.

This publicity is also important because many colleges and universities consider welding to be only lab or shop work and are eliminating it. They have not seen the great potential as a broad engineering program. Many college professors, particularly those at Ohio State, disagree. They have proved that the 5-year course offered by the Welding Engineering Department is broad enough to enable its graduates to enter many fields. The curriculum contains more course hours in civil engineering, electrical engineering, metallurgical engineering, mechanical engineering and industrial engineering than any other department, other than the hours required by each department of its own students. Welding engineering gives students an understanding of each of these fields and teaches them to use the best of each of these fields.

SCHOLARSHIPS FROM INDUSTRY

Scholarships are making it easier to study welding engineering. These are being offered by welding product manufacturing companies such as National Cylinder Gas Division of Chemetron Corp., Air Reduction Sales Co., Chicago Welding Sales Co. and its manufacturing subsidiary, York Engineering Co. A memorial scholarship has been set up to honor the late A. F. (Charlie) Davis of Lincoln Electric Co.

FINANCING THROUGH RESEARCH PROJECTS

OSU's Welding Engineering Department finds it difficult to support an adequate staff and facilities. They've found help in the income derived from research work for industry.

A staff of 16 people has been set up to do this work. It includes the five teaching members of the department. Those associated with the research program are: Dr. Quentin Van Winkle, professor of physical chemistry; Drs. George T. Rankin, G. H. McFadden; Jay Mitchell, electrical engineer; Merle Rhoten, radiographer; and eight research associates and assistants.

Typical research jobs done include studying welding power source characteristics, investigating the nature of the brazing bond, evaluating nondestructive testing equipment, developing x-ray image systems for weld inspection, studying spot welding controls and procedures. They get help on special problems from other departments in the College of Engineering.

The department is doing about $140,000 worth of research a year. Work is done for agencies of the Armed Forces and for private industry on critical welding and inspection problems.

The staff consists of five men who are dedicated to welding and welding education:

Roy B. McCauley: Professor and chairman; he is interested in welding metallurgy, weld discontinuities,

to design, fabricate, and inspect weldments

ROBERT C. McMASTER (right) and Robert Wright (center) check ultrasonic testing equipment. This equipment is typical of that housed in 8 different laboratories: research and processes, heat treating, materials testing, welding, metallographic, X-ray and radioisotope testing, and photographic processing.

WILLIAM L. GREEN, instructor in welding engineering (extreme left), discusses a design problem with a group of fifth year welding engineering students. The work is part of a required course that covers the design of welded joints, structural and machine elements.

weld bonding, and nondestructive testing.

Robert S. Green: Professor, executive director of the Engineering Experiment Station and associate dean of the College of Engineering.

Robert C. McMaster: Professor and electrical engineer; he is interested in electrical processes, resistance welding, and nondestructive testing.

William L. Green: Instructor and welding engineer; he is interested in design, processes, procedures, and resistance welding.

William H. Hill: Teaching assistant and mechanical engineer.

FACILITIES

The Department occupies 14,000 square feet of space in the Industrial Engineering Building. Equipment is housed in eight laboratories: research and processes, heat treating, materials testing, welding, metallographic, x-ray and radioisotope testing, and photographic processing.

Classes are held in a modern lecture room and a drawing room. The same building houses the Davis Welding Library, with 7,000 volumes on welding and related fields. One unique feature of the library is its collection of over 12,000 indexed patent specifications on welding.

The Welding Engineering Department also teaches required courses in welding to other students in the engineering and the educational colleges.

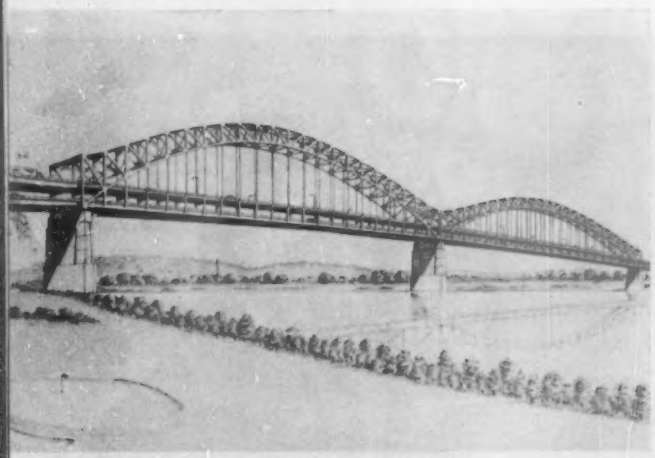
The staff also spends considerable time teaching welding, welded design, and nondestructive testing to key engineering groups in industry. Prof. McCauley conducts several in-plant courses each year. He spends about a week and a half at the company, reviewing their blueprints, in-plant projects, and fabrications. For example, he may spend a sequence of 15 days over a two-month period discussing and teaching an engineering department weld design and helping them solve problems.

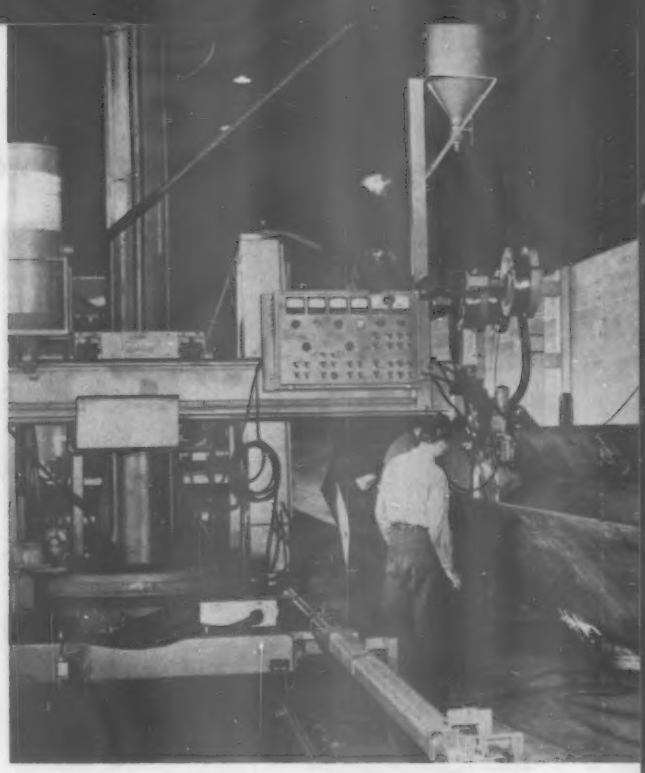
Prof. McCauley points out that there is a lack of coordination between design engineers and the plant people who fabricate the weldments. Many times drawings specify weld sequences to minimize distortion. But the men in the plant ignore the sequence because they can weld faster by ignoring it. Result: severe distortion.

Periodically, Ohio State's Welding Engineering Department offers summer conference courses on welding engineering and on nondestructive testing. These are intensive 2-week courses of instruction and practice. They help meet the educational needs of management, engineers, production supervisors, and technicians employed in welding and nondestructive testing. The Department has been very pleased with the reception of these courses; they are consistently filled long before the registration deadlines.

WHO ELSE CAN HELP?

Much can be done on a local level by the American Welding Society sections. They can contact junior and senior high schools in their areas and explain the advantages to be found in welding engineering, as well as trying to get additional industry-supported scholarships. • •





NEW ALBANY BRIDGE is a tandem tied arch, double-deck structure. Its main structural steel components are welded automatically on tandem arc equipment (right) which reduces welding time by 80 percent. Holes for bolted erection in the field are drilled automatically in a tape-controlled machine (opposite page).

Automatic welding and drilling

IN BRIEF: New bridge is being built faster because its main structural steel components are fabricated automatically wherever possible. It is the first bridge to use heat-treated high-strength constructional alloy steels.

OUTSTANDING PROGRESS in welded design, selection of steels, and fabricating techniques make the New Albany Bridge unique. It's now under construction at the Structural Steel Division of the R. C. Mahon Co., Detroit. The bridge will go over the Ohio River between Kentucky and Indiana.

Mahon holds the contract for the super-structure costing $5.4 million. Cost, including approaches and interchanges: between $14 and $15 million.

DESIGN BACKGROUND; SELECTION OF STEEL

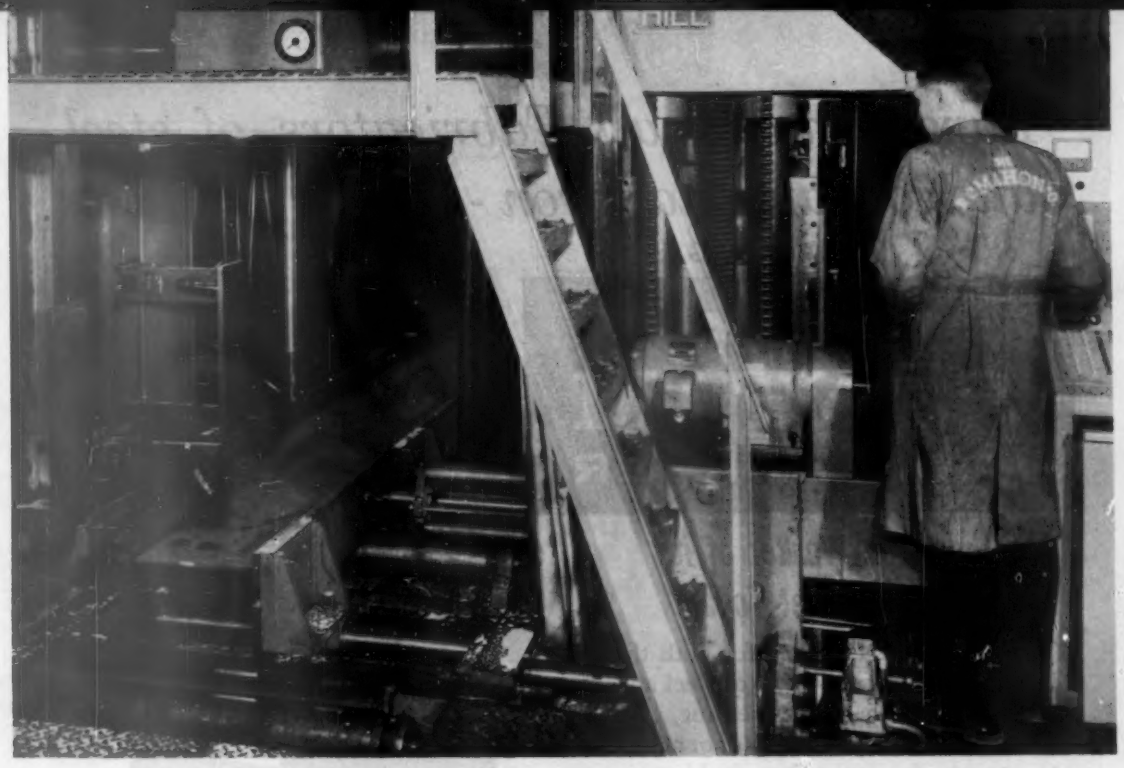
Hazelet & Erdal, consulting engineers, designed the New Albany Bridge. It is the first to use 100,000-psi-yield-strength constructional alloy steel. The bridge is a 1600-foot tandem tied arch, double-deck design, selected for economy and appearance. The double-deck, with three lanes on each of two levels, saves over $300,000.

The tied arch is statically indeterminate so Hazelet and Erdal used the large computer to reanalyze the entire truss with a minimum of effort for each change made while designing. They also figured secondary stresses and deflections on the computer. The erector company was also provided with basic computer data. From it, they prepared their erection schemes and determined stresses and joint displacements for the erection.

A tied arch on a bridge of this size practically demands high strength steel. The designers selected heat-treated high strength constructional alloy steels (Great Lakes Steel N-A-Xtra 100 and U. S. Steel T-1) for the tie and also in arch trusses where they proved economical. Over one-third of the bridge (by weight) is fabricated from these steels. They specified intermediate strength A242 steel (Great Lakes Steel Fine-grain and U. S. Steel Tri-Ten) for floor beam frame and truss members wherever economical. The remaining members were A7 and A373 mild steel.

All of these steels are weldable, so further savings were made by welding all major components. These are connected in the field with high strength bolts.

Savings made possible by using several grades of steel and welded fabrication exceed $\$^3/_4$ million in the main spans. This savings is apparent in the fact that the net cross sectional area of the welded high strength steel (with a stress of 5400 kips) is 125.3 square inches. A riveted silicon steel tie would have required a net section of 245 square inches.



speed bridge fabrication

BRIDGE FABRICATION

None of the materials available for welding the constructional alloy steels was considered entirely satisfactory. So, Mahon's Structural Steel Division developed welding wire and flux to meet the 100,000 psi requirements.

Improved techniques and new equipment are further reducing the fabrication costs of the bridge. Wherever possible, manual arc welding equipment has been replaced by new high speed automatic submerged arc equipment. Included are a tandem arc unit and two mast-and-boom units. These play an important part in reducing the cost of making 57 miles of welds on the bridge.

NUMERICALLY-CONTROLLED DRILLING

This bridge is the first to be fabricated with a tape-controlled drilling machine. It drills holes 85 percent cheaper than previous methods. Installation of this machine made by Walter P. Hill, Inc. represents the most important step to date in a multimillion dollar modernization program at Mahon's Structural Steel Division.

The cost savings are attributed to the elimination of laying out hole patterns, the use of high speed drilling, and the application of conveyorized feeding of beam and column sections into and out of the tape-controlled machine.

Mahon used to make holes in structural steel components by radial drilling and various methods of punching. These methods are being replaced as fast as possible. The high accuracy and hole pattern repeatability of numerically controlled drilling will eventually eliminate all costly reaming operations on detail plates, as well as on columns, beams, and built-up sections.

BRIDGE ERECTION

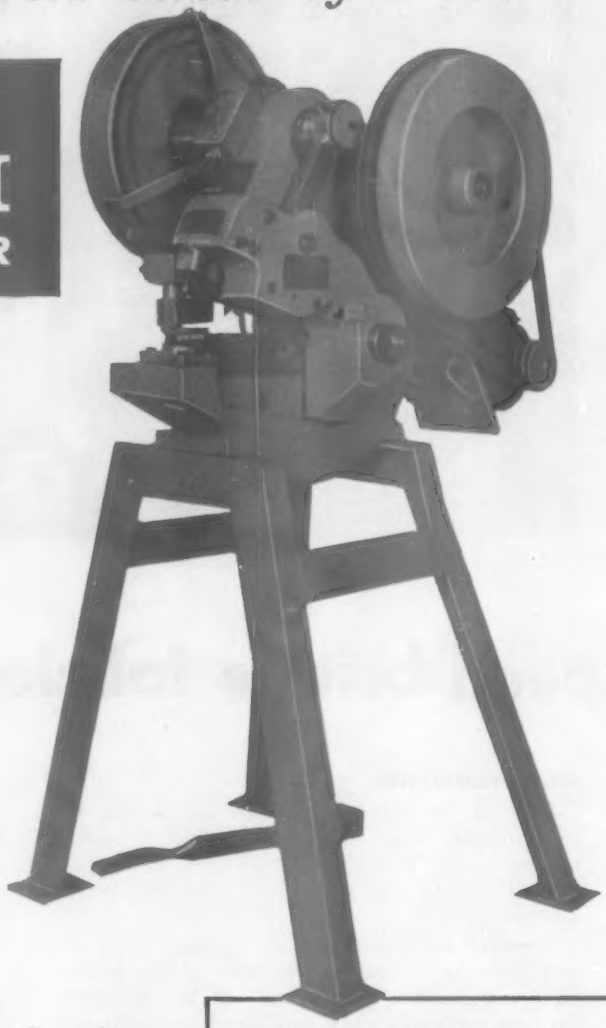
Erection problems were simplified by the John F. Beasley Company, holders of the subcontract for erection of the New Albany Bridge. They erected everything from below, using an oversized rig. It is believed to be only one of its size in the country. It has a 300-foot boom and 400-tons capacity. The rig easily handles arches that have to be placed 270 feet above the water.

Handling the erection from below avoids the need for a traveler working on the top chord. For erection purposes only four members are being modified in each truss, other than extensions of certain gusset plates to facilitate tiebacks. The extra amount of steel that will remain in the bridge as a result of this erection scheme is only 16,600 lbs. This is about 0.1 percent of the total steel weight and is almost negligible when compared to the extra steel required when conventional erection methods are used. • •

Large and Small Fabricators of steel and ornamental iron - swear by it . . .

THE AMAZING

BATEMAN BANTAM IRON WORKER



The Only Iron Worker of its Kind on the Market Today!

This machine is designed for both the large and small fabricators of steel and ornamental iron. The operator who owns a large iron worker cannot afford to operate the expensive machine on small cutting and punching when the Bantam will do it faster and cheaper. The Bantam cuts and punches fast and clean . . . no grinding necessary. It's versatile, and saves time and labor! Cuts 2" x 2" x 1/4" angle and 1/4" x 4" flats.

Punches 1/2" hole through 1/4" material. Operates by hand or foot, uses 3/4 hp motor (1750) rpm., powered with flywheel and drive gear.

The Coper will cope 1-1/4" through 1/8" material.

DIMENSIONS – Overall height 56" floor to shear blade 36", width 24" x 35".

NEW ACCESSORIES: Gauge for cutting to length, Guide for Flat Bars for cutting on ends, and Angle Iron Trimming Guide, for cutting at a 45 degree. Write for details.

BATEMAN BANTAM IRON WORKER, with motor and stand $575.00

Price does not include Blades, Punches or dies.

Shipping Weight .....750 lbs.

BLADES, PUNCHES and DIES at list price.

NOTE: Please specify Single or Three-Phase motor.

OUR 52nd YEAR

Write for complete information and name of the distributor nearest you.

Bateman Foundry & Machine

MINERAL WELLS, TEXAS

For More Information Circle No. 14 on Reader Service Card.

Are you buying too much weld metal?

IN BRIEF: Here's an article guaranteed to set you refiguring weld sizes. It shows that you are wasting weld metal, throwing labor to the winds, and actually harming your work.

THE STARTLING TRUTH is that every joint in mild steel —and that's 85 to 90 percent of all arc welding—is overwelded!

You can reduce your welding costs sharply and quickly without spending, changing processes, or even stepping up speeds. How? By using weld metal more efficiently. Smaller welds, better joints are the keys.

This is what happens: A designer calculates a weld using usual standards. Suppose he's joining ½-inch plates with fillets. He'll figure maximum shear stress in the weld throat at 13,600 psi and arrive at a 0.52-inch leg for full joint efficiency. The greatest force that can be applied to two ½-inch fillets, 1-inch long is 9,600 lb. (P = 13,600 x .707 x ½ = 4,800). This seems to say that welds as big as the plate is thick will not develop the full design strength of the plate (10,000 lb.) The truth is, however, when tensiles are pulled they always fail in the plate.

This means that the standards are too conservative; they don't take advantage of the excellent properties of the weld metal. (See WD&F January, page 34).

WELDS ARE STRONGER THAN BASE METAL

Mild steel welds made with metallic arc welding are stronger than the base metal. Therefore, every calculated fillet weld is overwelded.

Something else happens that piles more weight on the already overweight welds: Designers go a size larger than their calculations, just to be safe. A ¼-inch size becomes 5/16 inch. When the welding foreman sees the specs, 5/16 doesn't look big enough; or inspection wants "good heavy welds." The foreman ups the size to ⅜ inch. Finally, the operator, just caught underwelding, has reformed in time to make the weld a *heavy* ⅜ inch. Result: the overdesigned ¼-inch weld becomes a heavy ⅜ incher.

This means that the weld leg is 50 percent too long; twice the volume of weld metal needed. And since weld volume and weld cost rise or fall together, costs are more than doubled! And if this wasn't enough, how about distortion and heavier stresses caused by overwelding?

What can be done to reduce weld size? The illustrations are good examples. In Figure 1 the welds were based on ¾t (t = plate thickness) as a rule of thumb. Still conservative. When a ⅜-inch weld (¾ of ½-inch plate) was progressively reduced in size and pulled in tension, the weld did not fail until the leg size reached ¼ inch. Even at that, the weld strength was 24,600 lb., five times the requirement for the weld.

Figure 2 dramatically compares the size of the normally specified 0.52-inch weld with one whose shape and size were calculated to withstand the actual tensile and shear stresses. This theoretically correct fillet has a horizontal leg of 5/16 inch and a vertical leg of ¼ inch.

WEIGHT OF WELDS is shown in pounds per foot.

JOINT	PLATE THICKNESS											
	½"	¾"	1"	1¼"	1½"	1¾"	2"	2¼"	2½"	2¾"	3"
60° 1/8"	.84	1.70	2.83	4.27	5.98	7.93	10.32	12.90	15.81	19.00	22.48
45° 1/4"	.89	1.60	2.57	3.67	5.03	6.55	8.31	10.23	12.37	14.70	17.20
30° 3/8"	.98	1.60	2.41	3.35	4.35	5.55	6.75	8.15	9.67	11.37	13.08
20° 1/2"	1.12	1.80	2.50	3.30	4.18	5.17	6.20	7.32	8.50	9.85	11.15

AWS Highway and R.R. Bridge 1956 Prequalified Joints

CONTROL REINFORCEMENT

Weld reinforcement also increases weld cost if allowed to get out of control. Design specifications concerning reinforcement should be realistic. The ideal fillet is convex; the amount of convexity depending on the characteristics of the welding process used. It's a good idea to limit convexity in your specification.

Butt welds are overwelded too. Butt welds usually have to develop the full strength of the plate. So 100 percent penetration is called for. Yet, this does not take into account the excellent mechanical properties of mild steel welds. Furthermore, all butt welds have some reinforcement which contributes nothing to weld strength; the weld is already stronger than the plate. Figure 3 shows butt weld samples with varying weld penetration—all less than 100 percent. All tensiles broke in the plate, proving that reinforcement was not a factor. (Half of the specimens were machined flush.) Reinforcement simply wastes material and labor.

You may not be able to make butt welds smaller, but you can make them cheaper with better joint design. Joint design controls butt weld volume, just as leg size controls fillet weld volume.

The characteristics of the welding process have to be considered in designing a joint. A deeply penetrating process needs a different joint than one with shal-

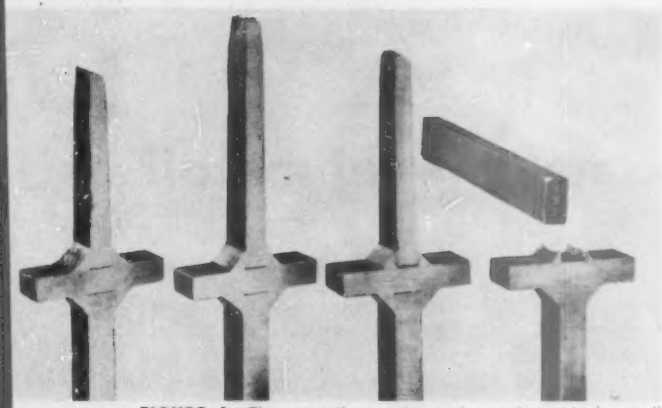


FIGURE 1: These tensile specimens have decreasingly small fillets (left to right) in ½-inch plate. The longest leg (left) was ⅜ inch plus, figured on ¾ of the plate thickness. All but the ¼-inch fillet (right) broke in the plate.

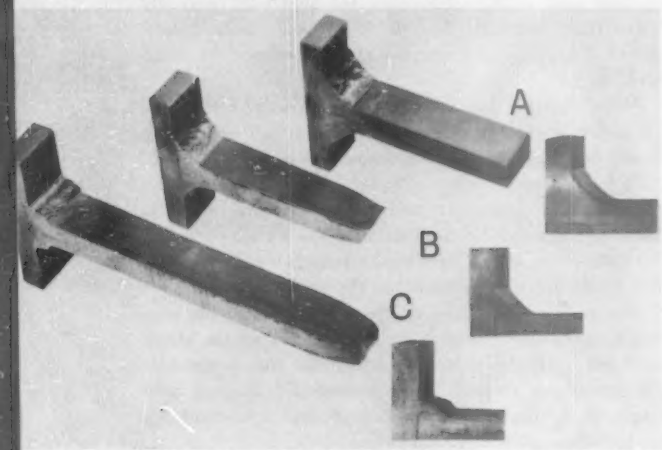


FIGURE 2: All three fillets develop the full strength of the ½-inch plate. Fillet A (0.52" leg) was figured using code standards; B, based on ¾t (⅜" leg); and C, the ideal shape to withstand the shear and tensile stresses (horizontal leg-5/16", vertical leg-¼"). C takes 220 percent less metal than A.

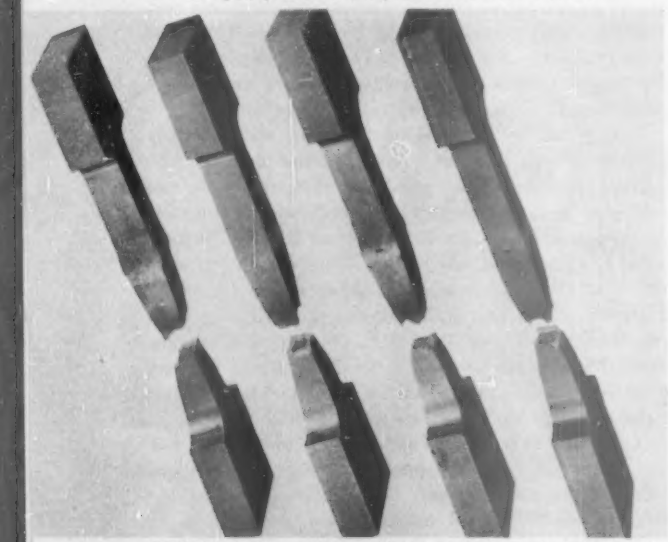


FIGURE 3: These butt welded tensile bars all failed in the plate; all three were made deliberately with less than 100 percent penetration. The root opening in the sample at left is over 30 percent of the effective throat, yet the weld held.

TOO MUCH WELD METAL *continued from page 33*

low penetration. Also, the root opening, bevel angle and radius, and plate thickness must be integrated in a good joint.

Example: A good joint design permits full penetration and fusion throughout. You have to be able to get at a joint to weld it. This means that such things as bevel angle and root opening have to take into account the characteristics of the process you are using. Sometimes, joint design is a compromise between bevel and root opening with the smallest possible weld.

What's the best joint for a 100-percent efficient weld in ½-inch plate? First choice (see table) would be one with a 60-degree-included angle V-bevel with a ⅛-inch root opening. As the plate gets thicker, the bevel angle is smaller, the root opening larger. A joint in 3-inch plate with a ½-inch root opening and a 20 degree V-bevel uses only half as much weld metal as the 60-degree V-bevel—costs 50 percent less.

You've got to conclude that inflexible joint designs can cost you money. Sometimes J and U grooves are preferred to V-bevels for heavy plate welding. A limiting factor, of course, is the availability of equipment. You machine J and U grooves, flame cut V-grooves. This means you need a lot of work to afford machining equipment.

LET LOAD GOVERN WELD SIZE

The big question: Are you buying too much weld? Welds should be designed for the loads they have to carry, nothing more. Too frequently appearance or plate strengths (not load) govern weld size.

For example, a 20-inch long ¼-inch fillet joined a 1-inch motor support plate to a base. The code says that the plate's shear strength is 48,000 lb. It also says that the bolt that holds the motor to the plate has a shear strength of 5,600 lbs. This means that the weld is actually over 8 times larger than it need be, rocketing costs over 600 percent; 1½-inch-long fillets on either side would have done nicely.

Machine columns and bases are often overwelded; the static loads they carry don't deserve full joint efficiency. Overwelding is simply an expensive way of chancing warpage.

You have to specify weld size to do economical work. And the one to do it is the designer. He has all the information on loads, joint designs, production equipment, and limitations. How he uses this knowledge determines how economical or expensive the welds are.

Sometimes, weld specifications can be refined through cut and try methods. First, build and test a pilot model to design specifications. If this passes, build others with successively smaller welds. The model with the smallest welds that meet test specifications is the most efficient, economical design. • •

EDITOR'S NOTE: "Are you paying too much for inspection?" is the title of the next article in this series. Look for it in our May issue.

18 HOURS IN A CEMENT MIXER...

(And $1.93 put it back in working condition.)

How much of a battering can a torch take and still keep working? Here's a test which Smith's engineers devised to find out just how rugged Smith's new heavy duty torch is:

The torch was tossed into a turning cement mixer where it clanked and flopped for 18 consecutive hours. At the end of that time, they stopped the mixer and removed the torch.

Damage? The retaining screw on the cutting lever had dropped out (cost 3¢); hose connections had broken off (they're removable by design and cost 50¢ each); and the tip nut was out of round (cost 90¢). The photos show the scars of battle.

The point is that by replacing a retaining screw, two hose connections, and a tip nut, the torch was back in operating condition. Total cost: $1.93.

You may never have occasion to give your torch a trip in a cement mixer, but whether you're a burner or a bill payer, down time and repair costs can hurt. This torch can cut them to a minimum.

The best part of the story is that for fast, efficient cutting, this torch is unsurpassed, whether for 24 gauge or 24 inch steel. We call it "Tuf-Tony, the Metaleater." Ask your Smith distributor for a demonstration or write for more information:

New! 4-color wall charts showing flame traits of oxy-acetylene and oxy-LP gas in cutting, welding and brazing. Your's for the asking. See your Smith distributor or write Smith's.

SMITH'S

SMITH WELDING EQUIPMENT CORPORATION
2633 Fourth Street S.E., Minneapolis 14, Minnesota

For More Information Circle No. 81 on Reader Service Card.

What do you really know about welding specs and codes?

by **HOWARD B. CARY**, *director,*
Hobart Bros. Technical School, Troy, Ohio

IN BRIEF: Here's the story on welding specifications and codes that used to establish and assure specific quality requirements.

WELDING SPECIFICATIONS and codes cover welding on the following: pressure vessels and boilers; buildings, bridges, and structural work; pressure piping; cross-country transmission line piping; ships; military ordnance and engineering material; military aircraft and missiles; and shipping containers.

TYPES OF SPECIFICATIONS AND CODES

Welding specifications, codes, and standards fall into these categories:

Federal government standards include all the different military (MIL) standards of the Army, Navy, Air Force, and Coast Guard. Also included are standards issued by governmental departments and bureaus, such as the Interstate Commerce Commission (ICC) and the Atomic Energy Commission (AEC).

State government standards include highway department codes that cover welding, particularly on bridges, in most states. In addition, many states have industrial commissions that issue codes. These usually cover pressure vessels and are based on the American Society of Mechanical Engineer's Boiler Code.

Local government standards are usually building codes. Many larger cities have codes that regulate welding on building and structures, and on pressure vessels.

Trade Association standards are used to establish product uniformity. Some of these that cover welding are: the Association of American Railroads (AAR) and the American Petroleum Institute (API).

Engineering and technical society standards are set up to maintain uniformity in the fields they serve. Foremost among those in the welding field are the American Welding Society (AWS), the American Society of Mechanical Engineers (ASME), and the

continued on page 38

Here's your guide to

MAJOR SPECIFICATIONS

The codes in widest use today are probably those concerning pressure vessels and piping; buildings and bridges; and transportation equipment.

Pressure vessels and piping are covered by the ASME Boiler and Pressure Vessel Code. In addition, there is the American Standard "Code for Pressure Piping" (B-31.1). The ASME Code is required by law in a majority of the states and in many of the Canadian provinces. This code covers the manufacture and installation of boilers and pressure vessels out to the first stop valve in single boilers and out to the second stop valve in the case of two or more boilers. The pressure piping code is not required by law. However, most contractors follow it when they install pressure piping. The National Board of Boiler and Pressure Vessel Inspectors is the enforcing body.

In addition, casualty insurance companies will not insure an industrial plant if pressure vessels, piping, and containers operating above certain minimum pres-

SPECIFICATION CONTENTS

Most specifications or codes in the same category are similar in content. These are the major groups:

Pressure vessels and piping: Section IX "Welding Qualifications" of the ASME Boiler Code is the basis for all welding qualification specifications involved with pressure vessels and pressure piping. Following the provisions of this code generally enables the operator to conform with any other code in this general category. Section IX contains the following:

Scope and definitions
Test positions for making welds
Type of test and details of specimens
Test requirement for acceptability

Procedure qualification variables:
Base material groupings
Filler metal grouping
Welding process listings and conditions
Type and number of test specimens required

Performance qualification variables:
Welder and operator qualifications
Essential variables and limits
Type and number of test specimens
Retest procedure

To comply with this code the contractor or manufacturer must first qualify a procedure specification and then qualify his operators before fabricating weldments in accordance with the code. Procedure qualification is obtained by writing a procedure specification and then qualifying it. This is a welding procedure that lists and limits all of the welding variables and defines various other conditions that must be followed. Qualifying the procedure requires that the conditions written in it must be faithfully followed in preparing

major welding specifications and codes

sure requirements are not installed in accordance with an approved code. Section IX of the ASME Code covers much of the welding.

Buildings and bridges are covered by local and state codes. In general, building codes follow the "Code of Standard Practice For Steel Buildings and Bridges" adopted by the American Institute of Steel Construction. This code, in the case of steel buildings, refers to the "Specifications for the Design, Fabrication and Erection of Structural Steel Buildings" which specifies that welding shall conform to the "Code for Arc and Gas Welding in Building Construction" of the American Welding Society. Local state and bridge codes follow "Specifications for Highway Bridges" by the American Association of State Highway Officials. The welding on bridges is covered by the "Specifications for Welded Highway Bridges" of the American Welding Society. These codes become legal requirements when contained in a structure's specifications.

Transportation equipment is subdivided into ships, railroads, and aircraft.

Shipbuilding and ship repair is covered by three codes, all of which are in close agreement: Section 26-Welding of the "Rules for Building and Classing Steel Vessels" of the American Bureau of Shipping; The United States Coast Guard's "Marine Engineering Regulations and Material Specifications" and the Bureau of Ship's (U. S. Navy) "General Specifications for Building Vessels for Machinery and for Inspection of Materials." Qualification procedures are practically identical for these three.

Railroad rolling stock is under the jurisdiction of the Interstate Commerce Commission which refers to specifications of the Association of American Railroads.

Airplanes generally are built in accordance with military standards as far as welding is concerned. MIL-T-5012A is used or the latest revision.

Automobiles and trucks are not covered by welding specifications, except for containers or vessels.

---

special weld specimens which are mechanically tested and pass the acceptability requirements.

Following qualification of the procedure specifications, all welding operators employed by the manufacturer or contractor must demonstrate their skill in making sound welds in accordance with the qualified procedure. One exception is allowed: The operator who made the weld specimen to qualify the procedure is automatically qualified.

The manufacturer or contractor must certify on forms shown in the code appendix that all procedures, and operators who followed them, were tested in accordance with the requirements. The procedure and the operator must requalify when any of the variables are changed beyond the limits specified in the code.

Buildings and bridges: The most widely used welding code applying to buildings and similar structures is the American Welding Society's "Standard Code for Arc and Gas Welding in Building Construction." The AISC Specification for design, fabrication, and erection of structural steel for building, as well as most local building codes, refers to this AWS Code.

The welding code applying to bridges is the American Welding Society's "Standard Specifications for Welded Highway and Railway Bridges."

Most state highway departments and railroads, the American Association of State Highway Officials, and the American Railway Engineering Association Specifications refer to this standard. They contain:

General provisions and definitions and welding symbols
Design considerations
Welding electrodes and equipment specifications
Workmanship standards
Welding inspection
Qualification of procedures
Qualification of operators

Welding joint designs presented in the specification may be used without making procedure qualification tests. The qualification of operators is accomplished by following the American Welding Society's "Standard Qualification Procedure."

Transportation equipment:

Ships: The three specifications previously mentioned are very similar in requirements. The welding sections are concerned primarily with plans and specifcations, workmanship and supervision, and operator qualifications. The standard joint designs shown are considered qualified. Operator qualification under one code is accepted by the other codes within the limits covered by the qualification tests passed. Six or seven test assemblies may be welded. Completion of each test will qualify the operator to do specific work only.

Railway rolling stock: Welding is covered by specifications of the Association of American Railroads.

Aircraft welding involves many codes. However, MIL-T-5012A covers aircraft welding operators certification tests which governs operator qualifications. Class A and Class B operators are defined. Four test specimens are used: butt joint in plate; butt joint in tubing; double fillet weld; and cluster joint of sheet and tubing. Certificates are issued but are valid only at a specific plant or operation.

SPECIFICATIONS AND CODES

continued from page 36

American Society of Testing Materials (ASTM).

Private industrial standards assure continuing quality by companies that make products not covered by any specifications or codes. In addition, many companies that follow trade association or engineering society standards still issue their own codes. These often are more strict than the trade standards. Utility companies usually have their own specifications. So do heavy equipment manufacturers and countless others.

Many of the specifications written by government bodies are enforced by law. Trade association and engineering society specifications are usually a standard of acceptance in purchasing agreements. Private companies enforce their industrial standards to insure quality in their own products and to maintain competitive advantages.

CODE RESPONSIBILITY

Each manufacturer or contractor is responsible for the welding done by his organization. Each must conduct the tests required to qualify the welding procedures he uses in fabricating weldments under the code, and the performance of his welding operators.

Contractors and manufacturers are responsible for all the welding incorporated in their work or product. This responsibility carries with it, the requirement of replacing at their own expense any work that does not pass the prescribed inspection and tests. Since it is impossible for the contractor or manufacturer to personally observe each weld, he must rely upon the establishment of procedures and practices that will assure quality work.

In addition, he will test each operator in accordance with the specifications to assure that the operator is capable of producing the quality work required. For this reason, companies involved with any code or specification will insist on properly tested operators.

Contractors must also maintain complete records of procedures and operator qualification. They must hold and use only as directed things like approval stamps. They must also, under certain codes, give requalification tests periodically. Of course, they must conform with inspection requirements of applicable codes.

Contractors and manufacturers must furnish proper supervision and inspection control to conform to established workmanship standards of the code under which the welding is regulated. • •

EDITOR'S NOTE: A similar discussion on qualification of welding operators follows in an early issue.

EMERSON ELECTRIC

NEW

PORTABLE 180c

A New High in Versatility... A New Low in Price!

PORTABLE 180c WELDER

- **VERSATILE**—for use in school, farm, small shop or contractor on the move . . . for welding, brazing, soldering, heating.
- **LOW COST**—low, low initial cost...low operating and maintenance cost.
- **PORTABLE**—only 68 lbs. total weight...truly hand portable.
- **HIGH OUTPUT**—180 amps full output...78 O.C.V....75% power factor . . . six conveniently located heat taps from 60 through 180 amps.
- **COMPACT**—only 21¾" x 14¼" x 10" in size.
- **EMERSON-ENGINEERED TO LAST**—quality constructed . . . backed by famous Emerson Electric guarantee . . . carries U.L., CSA, REA approval—NEMA rated.

EMERSON ELECTRIC of St. Louis

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A Complete Line for Most Welding Needs

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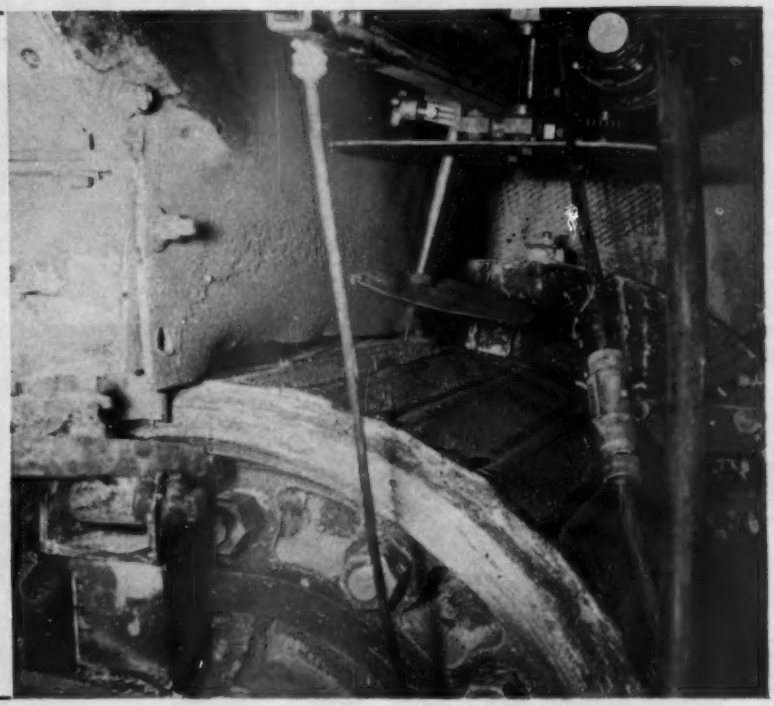
Announcing the

STOODY CRUSHERMATIC

a system for automatically rebuilding and hard-facing crusher rolls *in position!*



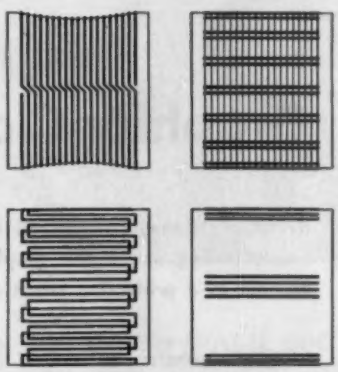
The Stoody CRUSHERMATIC is a new tool for the aggregate producing industry! It cuts rebuilding and hard-facing time on crusher rolls as much as 300 to 400% over manual welding and is 200% faster than hand-held semi-automatic welding!

Now you can gain *50% more crushing time*—get an *additional 30% more production* from the same crusher because rolls are *kept* out to size... are far more efficient!

Crushermatic is completely portable... ready to use in 20 minutes. It consists of a reciprocating, motorized carriage and wire nozzle supported on a rail over the crusher roll. Continuous wire, fed through the nozzle, can be deposited in a variety of weld patterns—all made possible by a versatile electronic control and an independent slow-speed roll drive. Crushermatic deposits up to 20 lbs. per hour, utilizing a standard semi-automatic wire feeding unit and power supply capable of 100% duty cycle. Deposits are sounder and more uniform than with manual or hand-held semi-automatic application.

Crushermatic does not replace your weldor—it simply removes him from the cramped smoke-filled area of welding. He sets up the unit, supervises welding *from outside the crusher*. It's safer, faster and eliminates long hours of back-breaking labor.

Detailed Crushermatic data is available from your Stoody Distributor—check the Yellow Pages of your phone book—or write direct!



A wide range of weld patterns can be set up with the electronic controls for rebuilding any specific wear problem.

STOODY COMPANY

11982 East Slauson Avenue, Whittier, California

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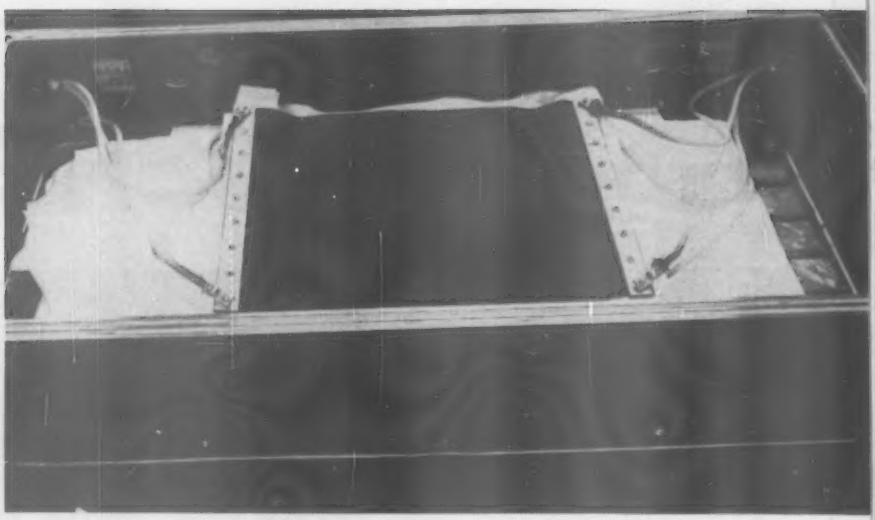

BRAZING CHAMBER, with panel and heating elements in place, needs only the top, an argon purge, and electric power to braze.

QUICK COOLING permits handling of panels within 6 minutes after brazing.

Graphite Cloth Speeds Honeycomb Brazing

IN BRIEF: Honeycomb panels are brazed with simple tooling and a new graphite cloth heating element in a protective argon atmosphere.

IT TAKES MINUTES instead of hours to braze stainless steel honeycomb panels with a new high-temperature brazing process developed by Rohr Aircraft Corporation, Chula Vista, California. Key to the new process is a pliable, durable, heat-shock resistant heating element cloth developed by the National Carbon Division of Union Carbide Corp. Rohr uses the cloth in a 37-cubic-foot brazing chamber along with several sheets of insulating quartz cloth and the panel to be brazed.

The process is extremely fast. It has brazed some test panels in nine minutes. The average time it has taken to braze panels of various thicknesses is 30 minutes. In production, Rohr expects to braze a panel an hour. Contrast this with the time it takes to braze honeycomb panels by other methods: 23 hours for furnace brazing; 6 hours for electric blanket brazing.

Industry forecasts predict huge demands for the strong, lightweight, heat-resistant honeycomb panels. Rohr thinks that the graphite cloth process is an

continued on page 48

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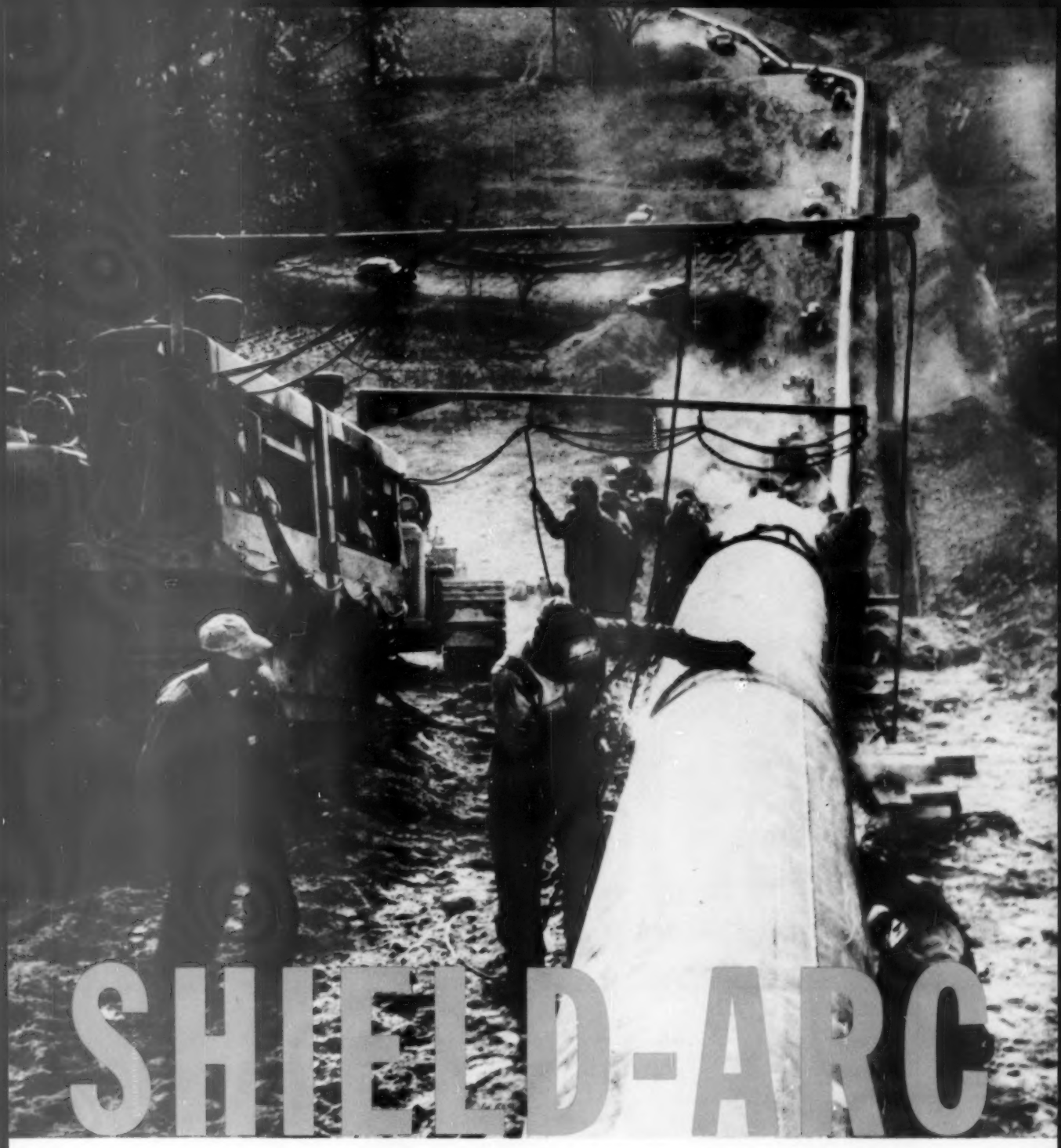
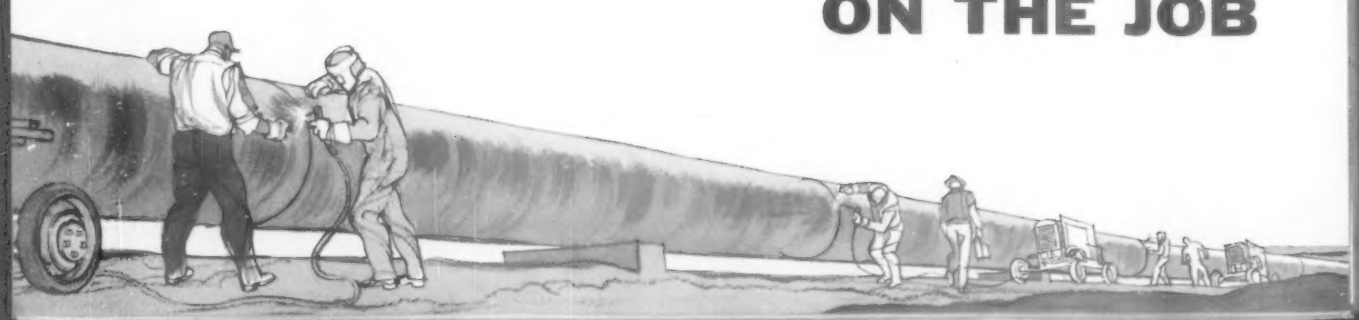


Stretch. Crane your neck. Squint. As far as you can see pipe—you'll see Lincoln Shield-Arc engine welders laying down metal. Why so many Lincolns? Because this contractor—after trying other makes—proved for himself that Shield-Arcs are unquestionably the best for day-in, day-out durability, operator appeal, reliability, low cost. The next few pages show why.

All-welded harbor warehouse in Long Beach, California, made architectural history as one of the largest, open-span buildings ever constructed. Contractor used Lincoln SA-200 welders which operate at low engine speed, require little maintenance, assure utmost reliability. The Lincoln SA-200 is by far the most popular gas engine welder ever built.

Even Louisiana swamps can't bog down these welding workhorses. Right this minute Lincoln machines are at work all over the world in the toughest imaginable field conditions—in jungles, Arctic ice packs, deserts. They're there on pipelines, refinery and building construction jobs because each part, from engine to brush holder to box-section frame, is built to give an extra margin of service, even when going is toughest.

THESE ARE LINCOLN SHIELD-ARCS ON THE JOB



Lincoln Shield-Arcs perform as well high in the Colorado mountains as they do at sea level thanks to the generous surplus power delivered by oversized engines. This reserve power means full generator output, no power drop-off even from older machines which have seen years of service. You get consistently excellent performance, low-cost maintenance, longest life with Lincoln Shield-Arc engine welders.

All construction welding is easy and trouble-free when you use Lincolns. They keep costs down, profits up. Weldors know, like and do their best with Lincoln machines. Dual Continuous Controls let operator select exact machine settings he knows will do the job best—whether flat, vertical or overhead. Idling device and design efficiency keep fuel costs low.

Chicago Bridge & Iron Company operates 685 engine-driven welders . . . 660 of them are Lincolns. Williams Brothers Company has 161 Shield-Arcs . . . all are Lincolns. Bechtel Corporation has 353 machines . . . 351 are Lincolns. And Pittsburgh-Des Moines Steel Co. has 53 at Neville Island . . . all Lincolns. There are many good reasons why these companies and others rely so heavily on Shield-Arcs.

Lincoln has a full line of gas or diesel machines . . . one for any job. Each is powered by a thoroughly proved-in-service Hercules, Continental or General Motors engine that will keep on running long after other equipment has given out. Idling device drops engine speeds to low idle to conserve fuel when not actually welding, automatically picks it up to operating speed when the arc is struck.

Each is equipped with Dual Continuous Controls which let a weldor select both welding heat and arc characteristics to suit his own technique. Once set, Lincoln Shield-Arcs hold their output indefinitely, won't drop off after extended use. This means better results on such critical work as stringer beads. Rugged, lightweight box-section bases on all Lincoln engine welders can stand the gaff when the going gets roughest.

Why don't you get this kind of rugged dependability and sure-fire welding performance? Put Lincoln Shield-Arc engine-driven welders on your construction jobs. Get all the facts from your local Lincoln Field Engineer . . . a specialist in welding.

LINCOLN WELDERS

SA-200 Most Popular 200-Ampere Engine Welder Ever Built

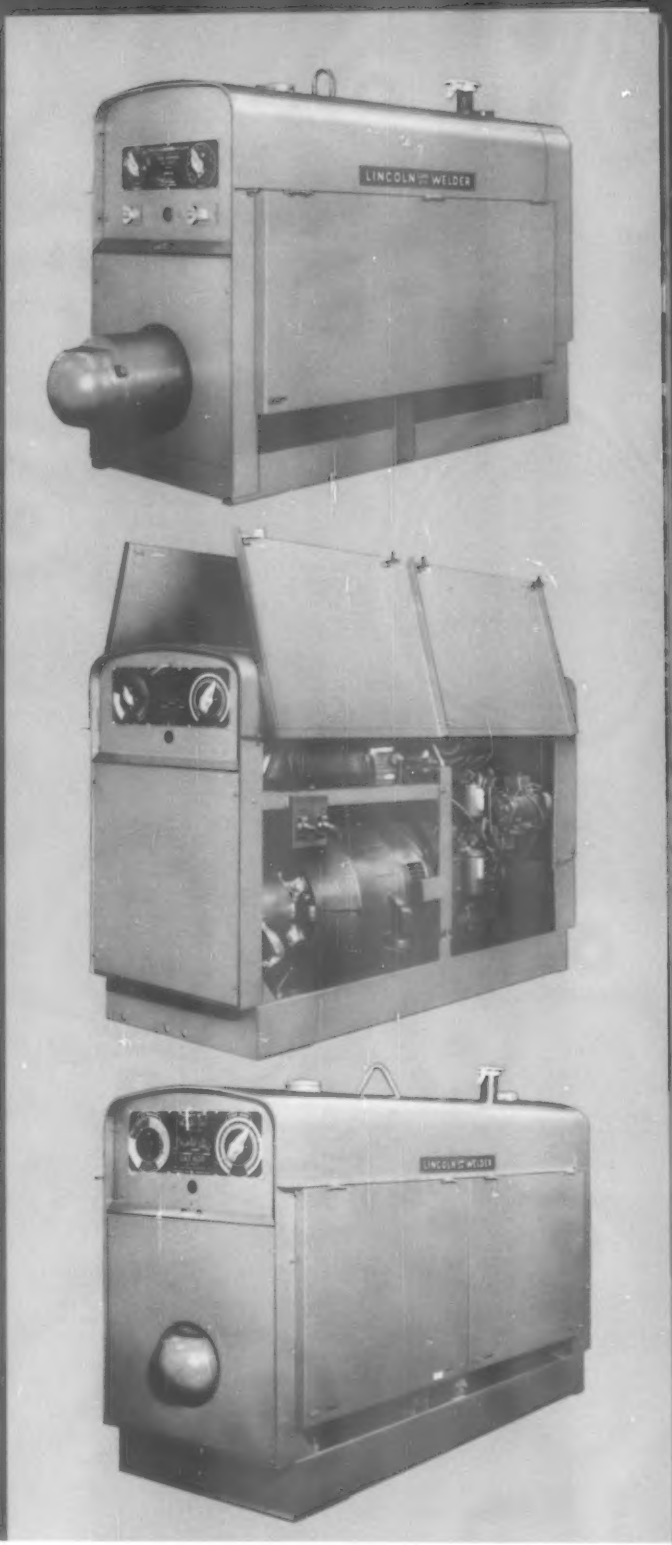
MODEL	SA-200
Current Rating (NEMA) at 40 volts	200 amps
Duty Cycle	60%
Current Range	40 to 300
Engine	Continental
Horsepower	36 @ 1450 rpm

SAE 300, 400 and 600 Machines Deliver Full-Range of Welding Currents

MODEL	SAE-300	SAE-400	SAE-600
Current Rating (NEMA) at 40 volts	300 amps	400 amps	600 amps
Duty Cycle	60%	60%	60%
Rated Current Range (amps)	60-450	80-600	120-750
Engine, 6-cylinder	choice: Hercules or Continental	Hercules	Hercules
Horsepower	47 @ 1400 rpm	63 @ 1400 rpm	82 @ 1400 rpm

Need Diesels? Pick from SAE 250, 300 and 400 Diesel Engine Welders

MODEL	SAE-250	SAE-300	SAE-400
Current Rating (NEMA) at 40 volts	250 amps	300 amps	400 amps
Duty Cycle	60%	60%	60%
Rated Current Range (amps)	50-325	60-450	80-600
Engine	Continental	GM	GM
Horsepower	35 @ 1700 rpm	35 @ 1675 rpm	50 @ 1625 rpm



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The World's Largest Manufacturer of Arc Welding Equipment and Electrodes

LINCOLN WELDERS

We can predict spot weld strength

says **W. A. SOWARD**, *Autonetics Div., North American Aviation, Inc.*

IN BRIEF: Certifying welds on a rerun of missile assemblies took as many tests as the first run—until a way was found to predict weld strength.

WE SPOTWELD most of the Navaho missile airframe. And because the airframe has thousands of welds and standards are high, inspection is difficult and costly. To find a cheaper, simpler way to inspect welds we examined these things, one-by-one:

- Material: kind, gage, cleanliness
- Electrodes: alloy, shape
- Welding force
- Welding current
- Welding time.

We found that once these things were properly related, we got good welds. Change something, and the welds were weak. When we find a successful combination, we use it on similar jobs. When we change the metal or the thickness, we change the machine settings to suit.

BEFORE PRODUCTION, MANY TESTS

We inspect spotweld quality by shear and macro-section tests. In fact, before we can weld a missile assembly, we m st certify by test that the welding machine settings will produce specification-strong welds. We pull ten shear tests on welds between each pair of sheets (called faying planes) in the assembly stack. The shear test is the tensile load it takes to shear the weld between two sheets. The macro, a polished and etched cross-section of test welds, shows the soundness, size, and penetration of the weld nuggets.

This intensive testing could not be avoided in certifying a welding assembly for the first time. But our procedure for reruns of the same job was exactly the same: Ten shear tests for each faying plane, and a macro-section. This was mighty expensive.

We decided to see if we could predict the strength of a weld from its diameter. To do this we needed figures. We got all we needed from the manufacturing department's weld test records. The records showed that most of the time nuggets of all sizes passed the shear tests. This meant that the little ones weren't necessarily weak. It meant that there's more to weld strength than nugget diameter. So we studied other things in multiple-sheet welds:

- ► Weld penetration
- ► Thickness of each pair of sheets in a joint
- ► Nugget diameter at the faying plane
- ► Position of a faying plane in a weld stack

Our study resulted in a formula for predicting shear strength accurately, regardless of nugget diameter. It took into account nugget size, metal, and the combined thickness of the thinnest contacting sheets in a stack. Our predicted results were essentially the same as tensile results. Trouble was, the method was too complicated for the shop to use. But it taught us two important things:

1. With the same nugget diameter, metal, and gage, the inner faying planes (in a multiple-sheet stack) are stronger than the outer planes.
2. For the same nugget diameter, welds in equal gages are weaker than welds in unequal gages.

Now we know that if a weld was good in equal gages, it would be even better in unequal gages. So

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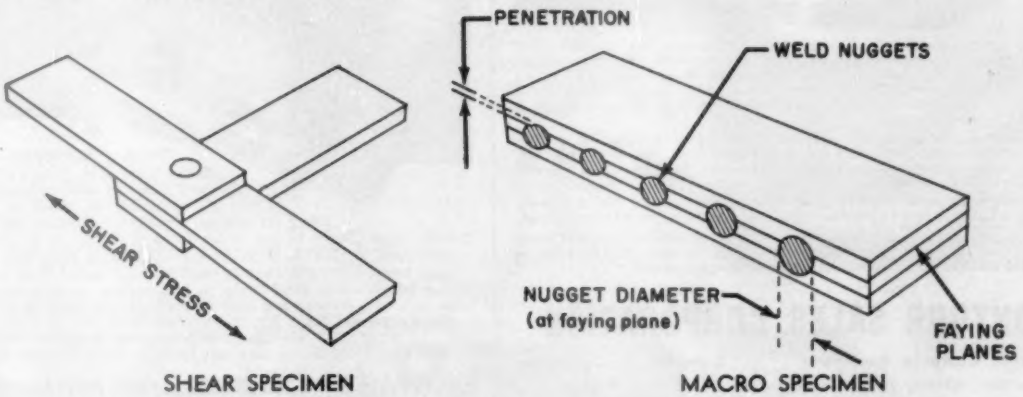
STANDARD TESTS FOR SPOTWELD QUALITY



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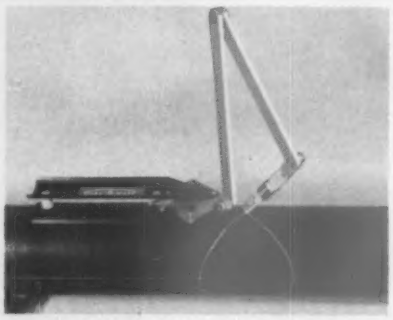
CONTOUR MARKER

Marks off any pipe joint or structural angle. Cut accurately, easily and without figuring cutbacks. Marks all around pipe. Saves time and gas. Available in 2 sizes of 1½" to 18" in cross-section, 16" to 48" diameter.



Combination Adaptor Accessory for Contour Marker

This new tool patent will prove to be a great advantage to the layman, allowing him to use all four sides of the Contour Marker in layouts on pipe or structural steel. It allows him to mark up to 30" pipe with the standard model without having to quarter or halve his pipe as he has had to do in the past. It allows him to mark over nipples, old welds, without having to break the wrap so far back on wrapped pipe.

It allows him to mark compound angles in one setting of the tool, also to mark off any portion of tube turns or 90 degrees he would so desire, as you will note in self-explanatory pictures.

The combination adaptor will also be furnished for the Jumbo Contour Marker on special order.

This tool will be sold by your welding distributor as an accessory to the Contour Marker.

Pro - Mag - Level

This level is designed for the fitter, welder, jig builder, for any layman who has angle or setting problems. The Pro-Mag-Level is 9" in length, 2" high, ¾" wide, weighing a total of 10 oz., a convenient pocket size. One side is machined to a flat plane for flat surfaces, the other side is machined to a slight V-plane for pipe work.

Body of level is made of strong aluminum casting to maintain lightness of tool. Scales are imprinted on one end for rise in degree per foot, on the other end degrees in rise per meter are imprinted.

Equipped with level and 90 degree dial marked in 2½ degrees, held in place by screw with pressure washer for easy setting.

Frame of level is equipped with two magnets on each plane for holding level in desired position, allowing the layman a third hand. Pictures of tool are self explanatory.

CONTOUR SALES CORPORATION

1843 East Compton Boulevard **Compton 2, California**

See Your Welding Supply Dealer For All Curv-O-Mark Products

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SPOT WELD STRENGTH

continued from page 45

we based our nugget diameter specifications on the smallest nugget needed for equal gage welds. We took the minimum shear strength for the gages being welded in a stack, added a safety factor, and substituted this factor into a formula to get the smallest nugget strong enough for the job.

PREDICTIONS SAVE RERUN TESTS

Now, certifying a job rerun is easy (and economical). Instead of pulling ten tests for every faying plane in the stack, we pull only *one* for each outer faying plane. The macro specimen is still required for repeat runs to test soundness and penetration. If these tests are satisfactory, we weld the assembly.

During welding we inspect at these intervals:

- Every hour
- After any job that takes more than 30 minutes
- Whenever job conditions change
- Whenever the operator, inspector, or supervisor request it.

X-RAY DOUBTFUL WELDS

We closely inspect materials, machines, and welds. If a weld doesn't look right, we x-ray it. If a machine is repaired or moved, we test it to make sure that it is still capable of making good welds. If strength predictions prove false we go back to extensive destructive testing until we find and correct the trouble. • •

SAW HOLES

Through Sheet or Plate!

With a MARVEL No. 1 Hole Saw Kit, you can save time and labor by sawing holes from ¾" to 2½" diameter in sheet or plate, using an ordinary portable electric drill or a drill press. Saws to cut holes from 9/16" up to 6" dia. are available. MARVEL High-Speed-Edge Hole Saws are heavy duty tools, having a cutting edge of high speed steel welded to a tough alloy steel body to insure fast cutting and long service life. Arbors are heat treated, rugged, and practically indestructible. No. 1 Kit is complete with ¾", ⅞", 1⅛", 1⅜", 1½", 1¾", 2", 2¼", 2½" Saws with necessary Arbors. See your MARVEL Distributor, or write for Hole Saw Bulletin HS-475.

ARMSTRONG BLUM MFG. CO.

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THE DURO "STANDARD"

- Featuring "Long Jaw Design" for reaching hard to get at places.
- Cool operation—cool handling.
- Insulated handle and guard protects the operator.
- All parts easily replaced.

THE "ADJUSTABLE TENSION"

- Easy adjusting of Spring Tension for your requirements.
- New type cable connection prevents fraying of cable.
- Aluminum model weighs only 13 oz.
- All parts replaceable including copper alloy jaw.

For further information write:

THE DURO ENGINEERING COMPANY

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Dirty Oxide-Scale Problem?

USE CHEMCLEAN "536"

- Prepares Stainless and Aluminum for Welding.
- Removes Scale and Oxides before or after Welding.

Eliminate costly, time-consuming grinding, scratch-brushing, or sanding on *Stainless Steel*. Simply wipe oxide off with one or two strokes of hand applicator. Clean small parts by dipping. For *Aluminum* just wipe with or dip into "536" at room temperature.

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"No secret—I use only virgin alloys in my spotwelding tips and machine them with the best equipment money can buy."

Resistance Welding Alloys our only product. An abundant inventory of spotwelding tips and related accessories, as well as the various grades of copper-alloy bar stock, maintained at all times.

tips—holders—wheels—copper alloy bar stock, forgings and castings

Catalog Available On Request

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INSIST ON **HI-AMP**®
MANUAL ARC WELDING
ELECTRODE HOLDERS
GROUND ATTACHMENTS

Buy from your local
WELDING SUPPLY HOUSE

LENCO, INC.
350 WEST ADAMS ST., JACKSON, MISSOURI

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HONEYCOMB BRAZING

continued from page 40

important step toward satisfying these demands.

Graphite cloth brazing eliminates a lot of the expendable tooling used in other processes. It takes much less electrical power, much less time. In furnace and electric blanket brazing (WD&F, August, 1960, page 28) a panel must be enclosed in an air-tight steel envelope with tooling and heat diffusers. It takes time and power to heat it all.

Cloth brazing heats only the panel. Heating, cooling, and argon pressure are uniform, avoiding distortion. The argon prevents the expensive alloys from burning up during brazing.

IT'S NOT HARD TO DO

Cloth brazing is simple. The operator covers the bottom of the clean chamber with several layers of quartz insulator, sandwiches the panel between two graphite cloths, and fills the chamber with argon gas. The panel comes from the lay-up room in a plastic bag, also filled with argon. The operator cuts away the plastic bag and places thermocouples at intervals between cloths and panel, tops it off with quartz cloth and clamps the lid on the chamber. He purges the chamber with argon, checks instruments, and turns on the power. Inspectors watch brazing through windows. Minutes after brazing (at around 1,680° F) heating elements and panels are cool enough to handle.

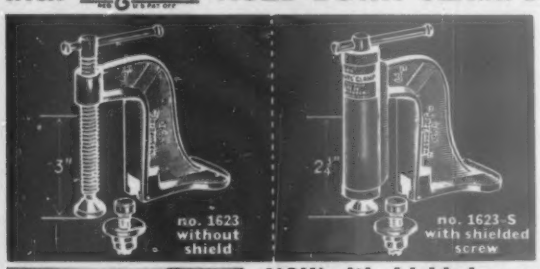
Rohr has brazed large honeycomb panels, all the way up to 3¾ inches thick, with excellent results. X-ray and destructive tests have shown that cloth brazing produces consistently sound fillets. • •

HOW THEY MAKE GRAPHITE CLOTH

The graphite cloth heating element used in the Rohr brazing chamber looks like blackened burlap. It's durable, flexible, and highly resistant to thermal shock. Tests prove that it can develop heats considerably higher than those used in brazing.

Any textile form—yarns, braids, and felts, or fabrics that are woven or knit—can be produced in graphite cloth. The production process is complex. A fiber or fabric such as rayon is graphitized by electrically heating it to almost 5,400°F. This changes the crystalline structure of the material to graphite, similar to manufactured graphite used for electric furnace electrodes.

NEW CLAMPING CONVENIENCE
with "Jorgensen" HOLD-DOWN CLAMPS



NOW with shielded screw for welding service.

Can be spotted on any work-surface (wood or metal), drill press or "T"-slot table. Ideal for temporary or permanent production set-ups.

Clamp slips "on" and "off" prespotted holding-bolt in seconds. It's there when needed, out of the way when not in use. Functions equally well in the middle or near the edge of work area. Doubles as vise along side of bench.

Patented "Jorgensen" steel shield POSITIVELY protects screw against welding "spatter" or other damage.

SOLD THRU DISTRIBUTORS—Write for details on complete line—"Jorgensen" and "Pony" clamps.

ADJUSTABLE CLAMP COMPANY
"The Clamp Folks"
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For More Information Circle No. 1 on Reader Service Card.

This metal powder spraying unit applies wear resistant, welded hard-surfaced overlays and the finest of metallized surfaces. Get maximum value through the dual usage of a Colmonoy Spraywelder.

HARD SURFACE cams, dies, rings, rolls, sleeves, and shafts with abrasion and corrosion resistant Colmonoy Sprayweld® Powders (5 grades), at 12 lbs. per hr., and with up to 95% efficiency.

METALLIZE with Colmonoy C-290 powder to rebuild crankshafts. Use other powdered metals to overlay worn journals, shafts, and bearings.

Learn more about the Spraywelder and Colmonoy hard-surfacing alloys. Write for the Sprayweld Catalog today.

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Tempilstik°

*temperature indicating crayons**

*Also Tempil° Pellets and Tempilaq° (liquid form)

Tempilstik°—a simple and accurate means of determining preheating and stress relieving temperatures in welding operations. Widely used in all heat treating—as well as in hundreds of other heat-dependent processes in industry. Available in 80 different temperature ratings from 113°F to 2500°F . . . $2.00 each.

Send for free sample Tempil° Pellets. State temperature desired . . . Sorry, no sample Tempilstiks°

Most industrial and welding supply houses carry Tempilstiks° . . . if yours does not, write for information to:

SALES DEPARTMENT

Tempil° CORPORATION
132 West 22nd St., New York 11, N. Y.

Visit us at Booth 528—A.W.S. Welding Show—New York Coliseum—April 17-21.

Circle No. 66 on Reader Service Card.

Steel Fabricators Meet In Florida

FORT LAUDERDALE: Jesse V. Honeycutt, vice president-sales, Bethlehem Steel Co., presented a plea for the removal of the hobbles which hinder the vigorous growth of the nation's economy at the annual meeting of the Steel Plate Fabricators Association held here early this year.

At the meeting Edward G. Cole, Jr., R. D. Cole Mfg. Co., Newnan, Georgia, was elected president. Other new officers include A. L. Davis, Pennsylvania Engineering Corp., vice president; F. E. Seery, General American Transportation Corp., treasurer; and J. Dwight Evans executive director of the Association, secretary.

COMING EVENTS

March 20-24, 1961: 12th Western Metal Congress and Exposition, Pan-Pacific Auditorium, Los Angeles.

March 24-25, 1961: Kansas Welding Show, Wichita Section, A.W.S. Wichita, Kansas.

April 17-21, 1961: American Welding Society Convention and Welding Exposition, Commodore Hotel and New York Coliseum, New York City.

April 24-25, 1961: International Acetylene Convention, Boston.

May 8-10, 1961: National Welding Supply Association Convention, New York City.

May 22-25: Design Engineering Conference, Cobo Hall, Detroit.

ARO Establishes Service Facilities

NEW YORK CITY: Due to the increased popularity of their ARO portable sport welders, the ARO factory has established its own service, sales, and warehouse facilities in New York City. Name of the new organization is ARO Spot Welder Corp. Headquarters will be large ultra-modern facilities at 66-10 Woodside Ave., Woodside 77, New York City.

Management of the new facilities will be in the hands of two vice president: Max Osborn, ARO representative since the introduction of the line, and Frank Furth, former vice president of Guthery Machine Tool Corp.

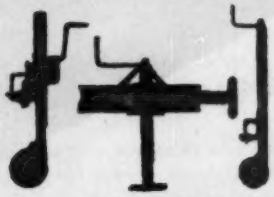
more news on page 82

a constant source of business for you . . .

A complete line of - Axle Assemblies, Trailer Undercarriages, Farm & Trailer Jacks, Implement & Trailer Couplers, Spindle End Assemblies

BULL DOG AXLE ASSEMBLIES

BULL DOG JACKS



BULL DOG COUPLERS

A COMPLETE LINE OF COUPLERS

SPINDLE END ASSEMBLIES

Complete Spindle End Assemblies for 2,500, 4,000 and 5,000 lb. capacities Per Pair. Available in complete assemblies or individual parts — Spindle Ends, Hubs, Wheels.

Contact our engineering department for full details on your particular application — a FREE service to you — write for Catalog 18-C

HAMMER BLOW TOOL CO.
WAUSAU • WISCONSIN

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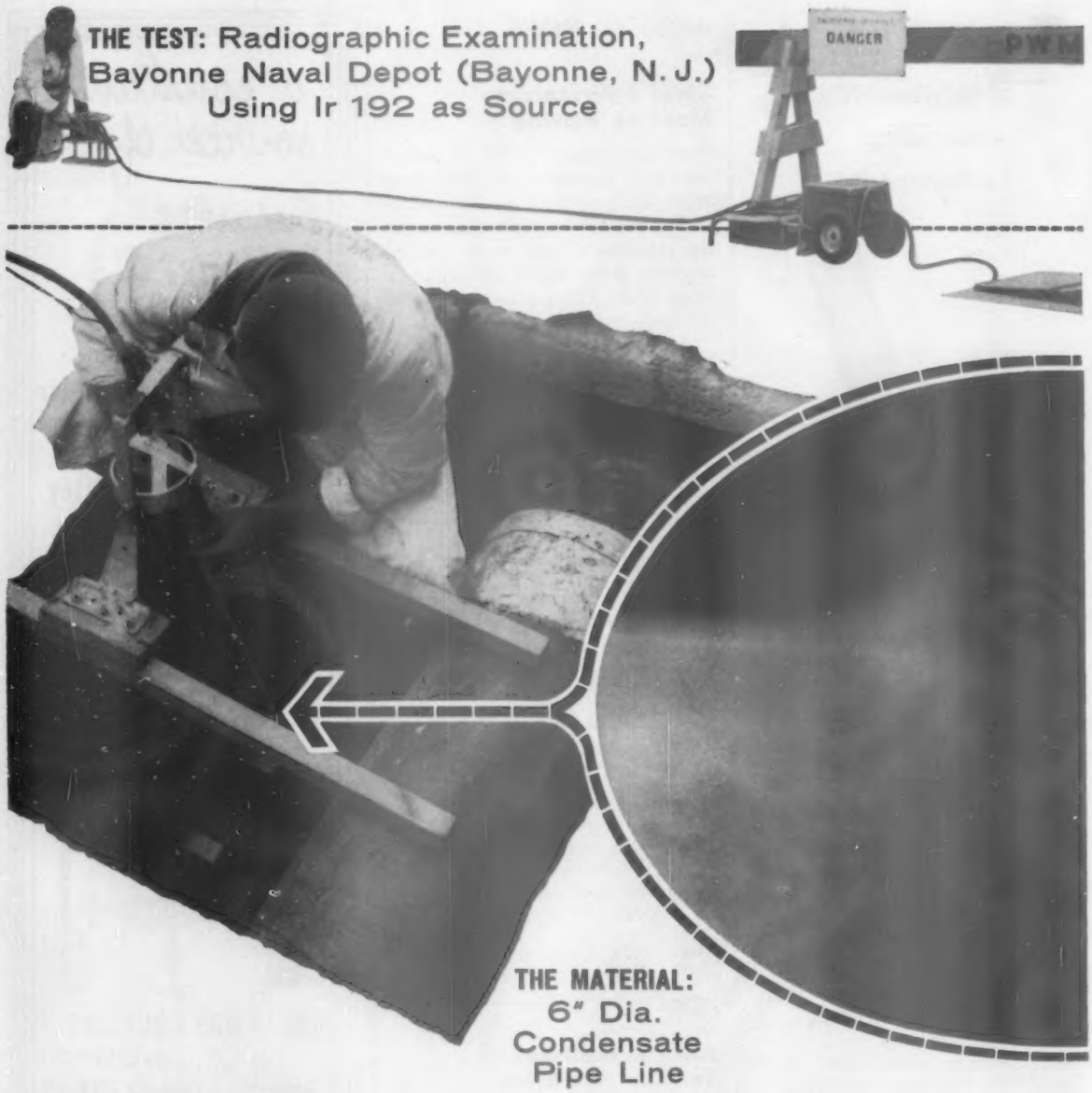


THE TEST: Radiographic Examination, Bayonne Naval Depot (Bayonne, N. J.) Using Ir 192 as Source

THE MATERIAL: 6" Dia. Condensate Pipe Line

THE FILM:

GEVAERT STRUCTURIX D7 X-Ray Film

Gevaert STRUCTURIX D7 X-Ray Film was used exclusively by the New York Testing Laboratories, Inc., for examining corrosion of steam line pipe walls at the Bayonne Naval Depot. Pipe sizes ranged from 1" diameter copper tubing, to 12" diameter steel schedule 40 extra strong steam pipe.

Gevaert STRUCTURIX D7 is chosen in laboratory and field testing for its maximum sensitivity to gamma ray exposure, and assures positive identification of the most hidden signs of corrosion or defective material.

Gevaert STRUCTURIX Films are available in five types, packed in standard sheets and rolls, in Uni-Pak (individual disposable cassettes) and in Bi-Pak (for multiple film technique). Each type is available in a wide range of economical sizes, and is designed to excel in its specific job application. Your inquiry for complete details and professional samples will be answered by the Gevaert Branch nearest you.

FREE! *Write for a Handy Exposure Calculator for either Ir 192 or Co 60 Radiography. Specify the one desired.*

THE GEVAERT COMPANY OF AMERICA, INC.
321 West 54th Street, New York 19, N. Y.
District Offices: Lincolnwood (Chicago), Ill. • Los Angeles Dallas • Denver • San Francisco

GEVAERT

For More Information Circle No. 33 on Reader Service Card.

SPECIAL REPORT

Nondestructive testing can save you time and money

says **ROBERT B. OLIVER,** *president, Society for Nondestructive Testing*

NONDESTRUCTIVE TESTING saves time and money in all fabricating fields, particularly in the field of welding and brazing. It makes savings at these four major steps:

Process development: The first and basic step in insuring a product's quality is the intelligent application of one or more nondestructive tests during the development of procedures and processes and the qualification of operators. Losses of time and money are minimized when sound fabrication practices are established.

Process control: Continued inspection monitors and controls the materials and processes. Finding discrepancies early means remedial measure can be taken before defective pieces accumulate.

Receiving inspection: Immediate rejection of defective vendor-supplied components saves time and money and fixes the fault with the supplier. Receiving inspection also insures against using defective components than can later cause rejection of your product.

Final inspection: At this stage it's too late for nondestructive testing to make any savings. But it insures the reliability of your product and assures your reputation for quality and integrity. The trend is for customers to require nondestructive testing during final inspection. Your ability to comply puts you in a favorable competitive position.

You only make predicted savings in time and money if inspection costs less than the expected savings. Fortunately the investment required can be large or small, depending on the volume of inspection, the need, and the worth of the product. Occasional jobs can be contracted to commercial laboratories, or you can install your own facilities. Analysis will show if in-plant facilities need be inexpensive, manual installations or elaborate, automatics set-ups.

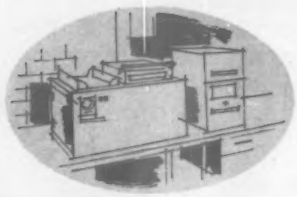
The key to accomplishing these savings is the intelligent application of the available methods and equipment. The case histories which follow give examples.

ABOUT THE AUTHOR: Robert B. Oliver is a native of Ohio. He received his education in metallurgical engineering at Ohio State University and the University of Alabama. Mr. Oliver taught for 12 years and then served in various capacities at the Oak Ridge National Laboratory and the Lawrence Radiation Laboratory. He is presently supervisor of nondestructive testing for the Solid Rocket Plant, Aerojet-General Corp., Sacramento, California.

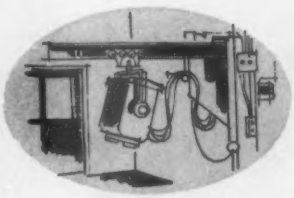
cost-cutting case histories follow on the next 18 *pages* . . . . . .

Nine different ways...

TVX
remote-inspection unit



Xeroradiographic unit for
dry-process radiography

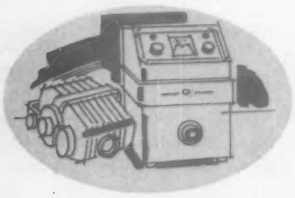


OX-250 general
utility x-ray unit

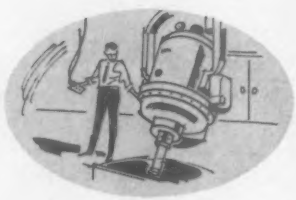
Resotron 300*—
300-kvp portable x-ray

OX-175 — 175-kvp
portable x-ray

LX-140 — ultra-compact
portable x-ray



LC-90 lightweight
mobile x-ray



Resotron 1000*—
million-volt x-ray

Resotron 2000*—
2-million volt x-ray

to look at your products!

Let General Electric X-Ray lend a hand

G-E x-ray inspection equipment covers every need — with units available in power ranges from 5 to 2,000-kvp output . . . choice of wet or dry radiographic processing . . . even *remote-television* x-ray fluoroscopy. Production-line, continuous inspection can easily be arranged where desired.

There's no need at all to settle for piecemeal help when you want x-ray apparatus, supplies or installation-planning assistance. Instead, take advantage of the industrial x-ray experience General Electric has gained through half a century of serving needs and solving problems much like your own. You stand to come out ahead in many ways. Our specialists have the knowledge that can find right answers in a hurry. Our research facilities are set up to solve even the most unusual puzzles.

For assistance with your inspection problems, contact our office in your area, or just write X-Ray Department, General Electric Company, Milwaukee 1, Wisconsin, Room WD-34.

* REGD. T.M.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For More Information Circle No. 31 on Reader Service Card.

WHERE TO BUY NONDESTRUCTIVE TESTING PRODUCTS . . .

COMPANY	X-RAY		GAMMA		FILM	MAGNETIC PARTICLE	ULTRA SONIC	PENETRANT
	Portable	Stationary	Portable	Stationary				
ANSCO, A DIVISION OF GENERAL ANILINE & FILM CORP. Binghamton, New York					X			
AUTOMATION INDUSTRIES, INC. 7750 Monroe St., Paramount, Calif.							X	
BALTEAU ELECTRIC CORP. 10-14 Meadow St., Stamford, Conn.	X	X						
BRANSON INSTRUMENTS, INC. 37 Brown House Rd., Stamford, Conn.							X	
BUDD COMPANY, INSTRUMENTS DIV. P.O. Box 245, Phoenixville, Pa.			X	X				
CURTISS-WRIGHT CORP., PRINCETON DIV. P.O. Box 110, Princeton, N. J.	X		X	X			X	
E. I. duPONT de NEMOURS Wilmington, Delaware					X			
EASTMAN KODAK COMPANY Rochester 4, New York					X			
GAMMA INDUSTRIES, INC. P.O. Box 2543, Baton Rouge, La.	X	X	X	X				
GENERAL ELECTRIC CO., X-RAY DEPT. 4855 Electric Avenue, Milwaukee 1, Wis.	X	X						
GEVAERT COMPANY OF AMERICA, INC. 321 West 54th St., New York 19, N. Y.					X			
HIGH VOLTAGE ENGINEERING Burlington, Mass.	X							
MAGNAFLUX CORPORATION 7300 West Lawrence Ave., Chicago 31, Ill.						X	X	X
MET-L-CHEK COMPANY 11919 S. Western Ave., Los Angeles 47, Calif.								X
MITCHELL RADIATION PRODUCTS CORP. E. Washington St., Norristown, Pa.	X	X	X	X		X		
NATIONAL ULTRASONIC CORP. 111 Montgomery Ave., Irvington, N. J.							X	
PHILIPS ELECTRONIC INSTRUMENTS 750 S. Fulton Ave., Mount Vernon, N. Y.	X	X	X	X				
PICKER X-RAY CORPORATION 25 South Broadway, White Plains, N. Y.	X	X	X	X	X	X		X
RADIONICS, INCORPORATED LaFayette and Water Streets, Norristown, Pa.			X	X				
ST. JOHN X-RAY LABORATORY Califon, New Jersey	X	X	X	X				
SPERRY PRODUCTS CO., DIVISION OF HOWESOUND CO. Danbury, Conn.	X					X	X	
TRACERLAB, INC. 1601 Trapelo Rd., Waltham, Mass.			X					
TURCO PRODUCTS, INC. 24600 S. Main St., Wilmington, Cal.								X
U. S. CASTING REPAIR CORP. 6432 Edmund Street, Philadelphia, Pa.						X		
ULTRA-VIOLET PRODUCTS, INC. 5114 Walnut Grove Ave., San Gabriel, Cal.								X
WESTINGHOUSE ELECTRIC CORP., X-RAY DIVISION 2519 Wilkens Avenue, Baltimore 3, Md.	X	X						

Ultrasonic testing

ULTRASONIC INSPECTION is used on weldments, castings, and forgings, on plate and sheet metal, rods, bars, and tubes. Two forms are available: One (resonance) is used for gaging thickness and detecting thinning due to corrosion. The other (pulse-type) finds internal defects, including cracks, poor bonding, inclusions and laminations. It is used to inspect long distances in metal and on large pieces.

ADVANTAGES

Ultrasonic inspection is a speedy process. It gives instantaneous, easy-to-read information on size, location, orientation, and degree of flaw. It allows inspection from one surface and gives clear indication of sub-surface defects over a range of depths up to 25 feet.

Equipment is mobile, light fairly inexpensive.

Accuracy is not affected by radiation, temperature, or pressure.

In measuring thickness, instantaneous readings are obtained in thousandths of an inch with an accuracy of two percent of thickness. Lends itself to automation.

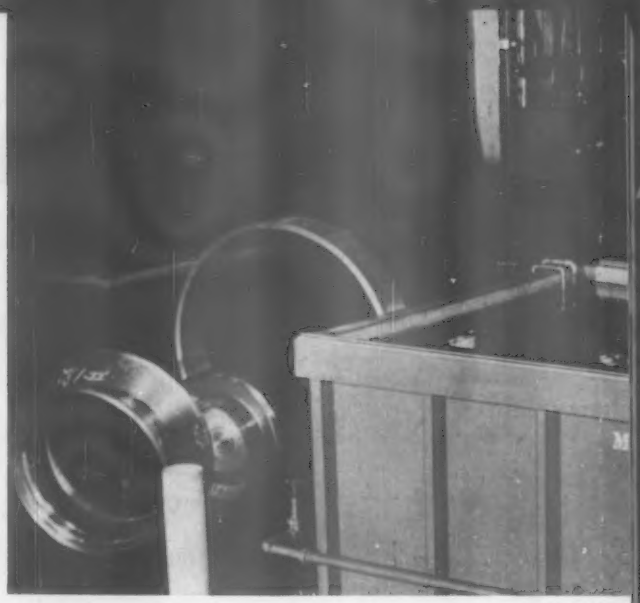
LIMITATIONS

Power source is necessary and photographs must be taken for permanent records.

Total immersion of parts is required with some types of equipment.

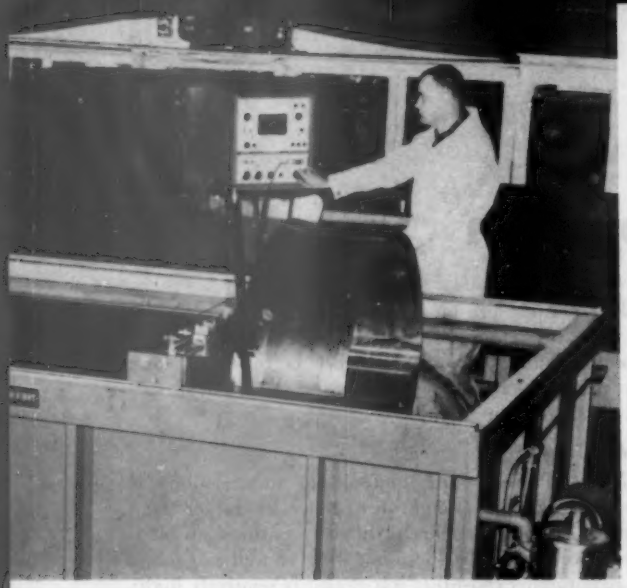
It is not useable on "as-cast" or "coarse-grain" materials, nor on small, irregularly-shaped parts.

A couplant (oil, glycerine, or water) must be used to provide a path for ultrasonic waves. Technicians need training in interpreting and analyzing defects.



THIS PORTABLE TESTER saves 30 to 50 percent of the time formerly needed for ultrasonical checking of pipe thickness. The increased sensitivity of the unit used (Magnaflux's Sonizon SO-300) permits immediate dial reading of thickness, even on very rough surfaces. Ten days had been allotted for extensive measuring on corrosion-pitted welded piping, but the new equipment did it in six.

Time savings are still greater (up to 90 percent) if the new ultrasonic thickness testing techniques are compared with the oldest procedure of drilling holes, calipering, and rewelding.



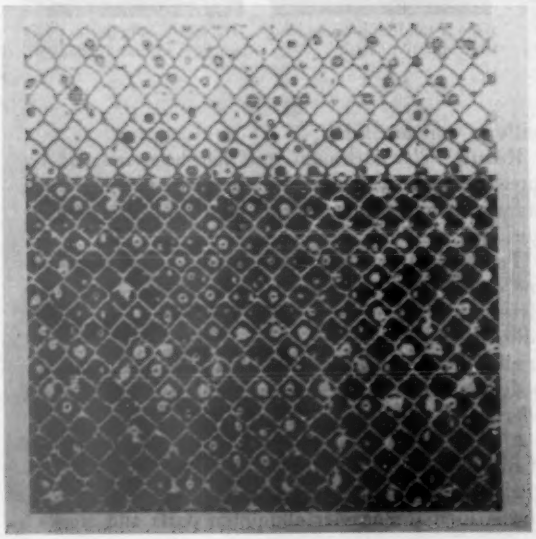
THIS NEW ULTRASONIC immersion testing facility extends the sonic-type flow detection capabilities of Baldwin-Lima-Hamilton's Standard Steel Works Division far beyond those of its conventional contact-type unit which is used for testing large, heavy forgings. The $25,000 set-up is used to test for tiny internal flaws in extremely high quality thin-section and complex-section steel, such as rings, motor casings, turbine discs, and compressor wheels for missiles and jet engines.

The thin-wall ring resting on rollers in the immersion tank is ready for testing. Built by Curtiss-Wright's Princeton Division, the facility consists of a special 11-foot by 7-foot immersion tank, with traveling bridge and scanner, search tube and manipulator, and the electronic control and indication equipment—designated an Immerscope—in a separate cabinet.

ULTRASONIC INSPECTION catches weld defects on a tube mill at Saginaw Steering Gear Division, General Motors Corp. The 3-inch o.d. tubing is formed and resistance welded continuously from 0.065 SAE 1020 strip stock. The detecting is done by an ultrasonic reflectoscope made by Sperry Products, Inc.

Old way: A four-step procedure was used. First, a 5 percent minimum expansion test determined ductility of weld and tube. Second, a torsion test checked ultimate strength. Third, a fatigue test determined service life. Finally, weld quality was checked hydrostatically.

New way: Ultrasonic testing rejected every sample and all production that had failed the 5 percent expansion test during a two-month period. All rejected tubing that was assembled into automobile propellor shafts for testing failed the fatigue test. No shaft passed by ultrasonic testing failed. Some types of failures rejected by ultrasonic testing passed the hydrostatic test, but no tubing which passed failed the hydrostatic test.



BRAZED HONEYCOMB panels for B-70's are inspected and recorded by Automation Industries' Ultragraph ultrasonic system. This saves time and money by letting engineers evaluate joint conditions and take corrective action. This test specimen clearly outlines the condition of the facing sheet attachment to the honeycomb core, puddles of brazing material, and areas of unbond. Both positive and negative presentations are shown.

turn the page to see how industry uses radiographic testing to save time and money

Radiographic Inspection

RADIOGRAPHY (X-ray or gamma) is used to inspect the interior soundness of all metals. It detects internal defects in welds: gas porosity, slag inclusions, incomplete penetration, cracks, icicles, and burn-through. It is also used on castings, forgings, and worked and formed metal parts.

ADVANTAGES

Radiography shows the size and nature of hidden flaws or discontinuities in different thicknesses of metallic and nonmetallic materials. It gives a permanent, graphic record of defects. It has established standards, is easy to interpret and is accepted by the government and private agencies.

X-ray: Energy can be adjusted for use on a variety of materials and material thicknesses; radiation source can be turned off when not in use; generally gives greater sensitivity than gamma techniques; fluoroscopy techniques are usually available; better than gamma on extremely thin sections.

Gamma: Needs no electrical power sources, nor oil- or water-cooling; is more portable; smaller source holder permits use on intricate or complex jobs; can be used for panoramic techniques that might not be possible with X-ray; initial cost is relatively low; shows up defects on a wider range of metal thicknesses on the same radiograph.

LIMITATIONS

X-ray: Power source and oil- or water-cooling is needed; size and weight are generally larger than gamma equipment; more difficult to position on intricate or complex jobs; does not work as well as gamma on panoramic exposures; initial cost is relatively high; shows up defects on a narrower range of metal thicknesses on the same radiograph; trained technicians are needed.

Gamma: Energy cannot be adjusted; isotope must be chosen to meet the sensitivity requirements of a particular type and thickness of material; radiation source cannot be turned off; government license is needed; sensitivity is not as great as with X-ray; fluoroscopy techniques are not normally available; not as good as X-ray for extremely thin sections; trained technicians are needed.

4 steps to automatic film processing

Parts are identified when they reach testing lab.

Adjusted controls remain constant during developing.

Film is guided into machine by rubber rollers.

Dry, chemically-perfect film emerges in only 13 minutes.

A TWO-THIRDS REDUCTION in radiographic inspection time has been made possible by the use of automatic film processing at Aircraft X-Ray Company, Huntington, Calif. The company has 14 X-ray units with capacities up to 250Kv, as well as gamma equipment. They inspect weldments and castings for aircraft and missile manufacturers.

Old way: Hand processing took from 60 to 80 minutes. This included 5 to 8 minutes for developing, 2 minutes for rinse, 10 to 15 minutes for fixing, 20 to 30 minutes for washing, and the remainder for proper drying. And, there was always the possibility of damaging the film.

New way: The company installed a Kodak X-Omat industrial x-ray film processor. This delivers fully processed, dry radiographs in 13 minutes. These are uniform and unmarred.

Result: The darkroom staff has been reduced by three and business has increased, particularly on rush orders, where customers wait on-the-spot for test results.

Tricks of the trade: If the part to be inspected is one of a type that has been tested before, a card file gives the company length of exposure, kilovoltage, milliamperage, distance and position for the radiographic exposure. If the part is a new one, this data is determined and inserted in the card file for future reference.

Aircraft X-ray uses slower, fine-grain Kodak Type M film for inspecting aluminum and magnesium parts (70 percent of their work); the faster Kodak Type AA film is used for heavier aluminum parts and steel.

NOW!

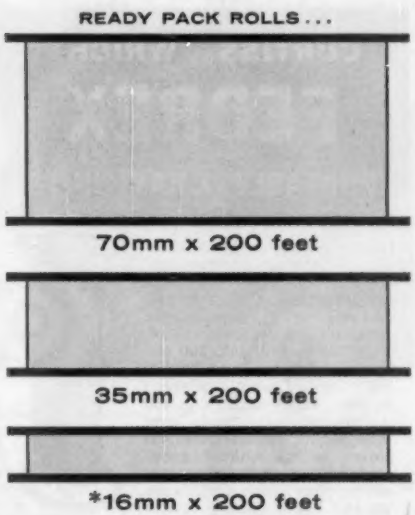
READY PACK IN ROLLS...

Kodak Industrial X-ray Film, Type AA and Type M in 16mm, 35mm and 70mm widths, 200-foot lengths

Here is America's preferred Industrial X-ray Film in a new convenient form—in 200-foot rolls, and in three widths. Ready Pack rolls are the answer for panoramic or moving slit methods of radiography of thin-wall vessels and pipe, honeycomb, circumferential welds, etc. Unroll the needed film, cut it off, seal the ends with opaque, pressure-sensitive tape. You are ready to inspect aluminum or magnesium alloys, thin steels or anything where lead screens are not required.

Ready Pack rolls are supplied on cardboard cores, 12 inches in diameter. The film is enclosed in a light-tight wrap-around sealed covering, without interleaving paper. It keeps clean and does away with darkroom loading. For processing, just separate the wrap along the sealed edge and remove the film.

For further information or to order a supply, contact your x-ray dealer or write us for a Kodak Technical Representative to call.



*For the present this size available only on a special order basis.

EASTMAN KODAK COMPANY
X-ray Sales Division, Rochester 4, N.Y.

Kodak TRADE MARK

For More Information Circle No. 26 on Reader Service Card.

THREE-FOLD FUNCTION is performed by Balteau's portable X-ray equipment at Fisher Tank Company, Chester, Pa.

First: All welding operators are required to take qualification tests before they are hired. The old procedure of machining and cutting test plates and bending the coupons has been eliminated. Now, Fisher X-rays the plates. Dollar savings have been remarkably high and testing time has been reduced.

Second: Structural attachments and parts of field-erected tanks are inspected prior to delivery to the job site. Complete shop-built tanks are also X-rayed before shipment. This reduces the possibility of costly rejects after installation.

Third: Weld seams in field-erected storage tanks are inspected during construction on spot- and continuous-basis according to specifications.

The weld seams of the 1.5 million gallon water storage tank (above) are radiographed at a height of 56 feet. X-ray unit weighs 48 lb., control panel 26 lb.

Lightweight • Compact • Rugged!

CURTISS WRIGHT

FEDREX

PORTABLE X-RAY UNITS

Small, portable, high-powered FEDREX units are the most flexible and useful X-Ray equipment ever offered. Their high ma output, long duty cycle and rugged construction are unequalled. Available in 140, 160, 200 and 260 KV units. (160 and 200 KV 360° models also available.) Stepless independent KV and milliampere adjustments over wide ranges permit exact exposure setting without guesswork. Built-in synchronous timer and exposure charts simplify setups and assure accurate results.

Shielding in the X-Ray head reduces stray radiation from all models to 5mr/hr or less at 10 feet. Automatic shut-off controls provide complete overload and flashover protection.

Write for additional information or phone SWinburne 9-0500

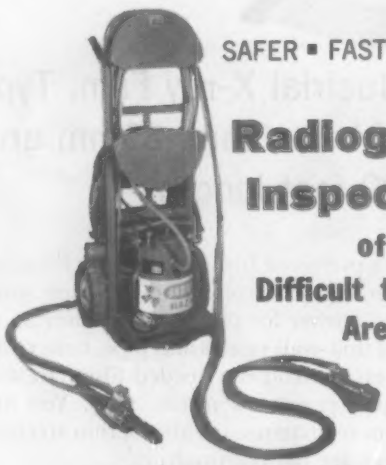
CURTISS WRIGHT

Princeton Division CORPORATION Princeton, New Jersey

For More Information Circle No. 22 on Reader Service Card.

SAFER ▪ FASTER ▪ BETTER

Radiographic Inspections of Difficult to Reach Areas



PUFF CAMERA*

Ideal for radiographic inspection of welds, forgings and castings that are difficult to reach. A small flexible camera head and reinforced source cable permit insertion through small openings leading to otherwise inaccessible areas. The PUFF CAMERA's rapid source travel, propelled by compressed air, and remote control features allow exposures with maximum operator safety. Largest stock model handles 40 curies of cobalt 60. Special and custom units are available. *T.M.

Write for additional information or phone SWinburne 9-0500

CURTISS WRIGHT

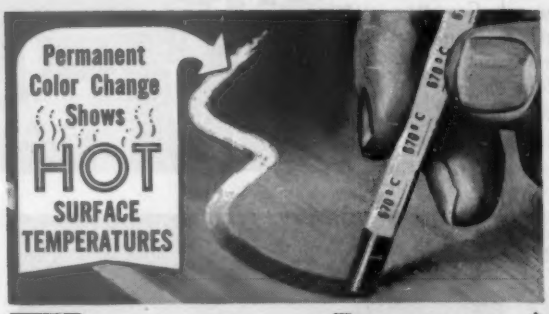
Princeton Division CORPORATION Princeton, New Jersey

For More Information Circle No. 23 on Reader Service Card.

A 300 PERCENT INCREASE in welds X-rayed is reported by Herrick L. Johnston, Inc., Columbus, Ohio. This company makes ground-handling equipment for major rocket and missile programs. They use X-ray inspection to guarantee weld strength and get the permanent records required by law.

James C. Lutz, quality control supervisor, says "DuPont's new Day Pack Roll Film let us triple circumferential welds X-rayed in a single 8-hour period. It used to take two men all night to shoot and process two seams with cut film. Now, the same team completes an entire vessel of six seams a night."

Gwynne A. Wright, director of manufacturing, explains that total processing time for an entire vessel is 84 minutes. The company now processes 22 feet of roll film in the same 5-gallon developing tank they used to need for 9 feet of cut film.



Thermochrom*

Temperature Indicating Crayons

Easy to carry and use, Thermochrom crayons are indispensable when quick checks of hot surface temperatures are desired. A clearly visible, distinct change of color indicates temperature reached. All color changes are permanent and much easier to recognize than old-fashioned, melting type indicators. Heat indication accuracy is unaffected by high voltage, magnetic fields, ionized gases and static electricity. Eighteen crayons cover temperatures ranging from 150° to 1240°F. Crayons $2.00 each. Full assortment $36.00.

*T.M.

Colorful folder available

Write for additional information or phone SWinburne 9-0500

CURTISS WRIGHT

Princeton Division CORPORATION Princeton, New Jersey

For More Information Circle No. 86 on Reader Service Card.

Mark 5F Ultrasonic Flaw Detector

Price for single frequency unit — **$1785.00** plus accessories

Portable, ultrasonic testing equipment provides on-the-spot inspection of metals, ceramics and similar materials. Curtiss-Wright's Mark 5F clearly locates cracks or other internal and surface defects with exceptional close-to-the-surface sensitivity. The Mark 5F is designed to provide optimum performance over a broad range of quality improvements and cost reduction applications in laboratories, shops, or in the field.

- **Portable** — 5¼" wide x 10⅝" high x 18⅛" deep
- **Lightweight** — weighs only 28 lbs.
- **Exceptional Sensitivity** — detects flaws as small as 1/64" diameter
- **High Resolution** — defects of 3/64" diameter can be detected .030" below the surface.
- **Operating Flexibility** — provides test frequencies from .6 to 5.0 megacycles.
- **Clear Presentation** — high brightness cathode ray tube provides easy viewing, even in full daylight.

Write for additional information or phone SWinburne 9-0500

CURTISS WRIGHT

Princeton Division CORPORATION Princeton, New Jersey

For More Information Circle No. 87 on Reader Service Card.

flaw hunter

you find cracks and hidden surface flaws

in ✓ **metals**
in ✓ **plastics**
in ✓ **ceramics**
in ✓ **glass**
in ✓ *minutes*

USE PIXchek penetrant dye system for inspection after any metal-working process—casting, forging, welding, grinding, extruding, drawing, shearing—the gamut of operations. PIXchek is equally adaptable to single part or quantity-run inspection.

Everything you need is in this handy flaw-hunting kit

Sturdy steel hinged case with aerosol spray cans of PIXchek Dye, Cleaner, and Developer, plus extra cans of Dye and Cleaner for brush and wipe-on applications. The coupon below can start you flaw hunting right away.

$ only **35**

Picker X-ray

PICKER X-RAY CORPORATION
25 So. Broadway, White Plains, N. Y.

Please ship ☐ PIXchek Kits @ $35.00

Name_____ Title_____

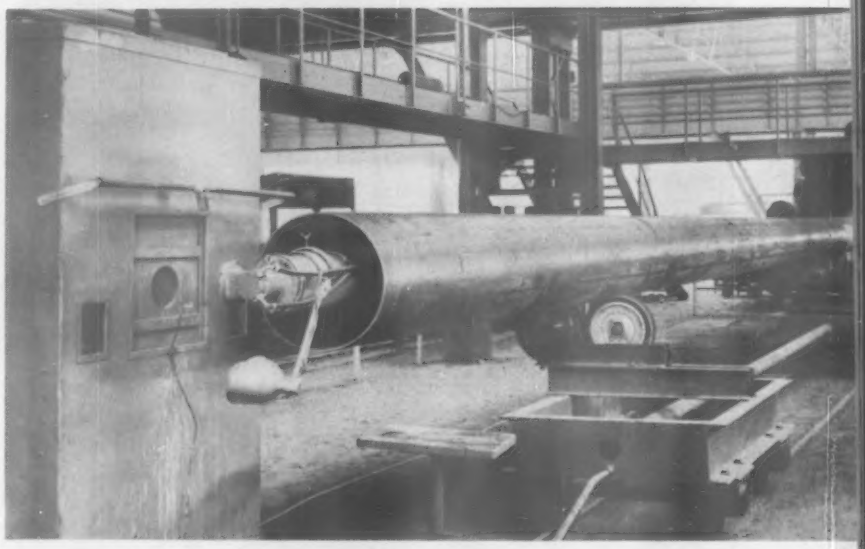
Company_____

Address_____

City_____ Zone_____ State_____

Purchase Order No._____

Circle No. 56 on Reader Service Card.

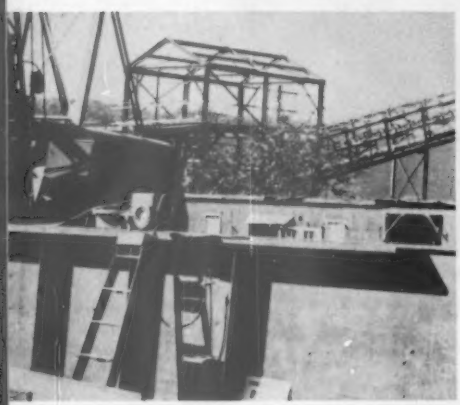


PORTABILITY of gamma ray equipment makes it handy for inspection in the field or in the shop. Here, an Iridium 192 exposure is made on butt welds in steel girders. This is being done at the J. K. Welding Co., Yonkers, N.Y., as an inspection requirement for the George Washington Bridge Approach. Cassettes are loaded with Gevaert Company of America's D7 fine grain film which gives high contrast.

Data: 2-inch butt welds; 16 minutes exposure; 15 inches from film to source.

X-RAY CAMERA is an essential tool during pipeline construction. It takes skilled crews from Texas Eastern Transmission Corp. only about 25 minutes to insert the camera, shoot the picture, and develop it at the site. The camera here is inserted into the pipeline up to the point of the weld. Then it takes a full 360° X-ray picture. Three-legged supports open up to the diameter of the pipeline, position the camera, and hold it steady.

AN 80 TO 90 PERCENT cost savings resulted when a pipe manufacturing company used a fluoroscopy inspection system from Philips Electronic Instruments. The company builds transmission line pipe whose longitudinal welds must be completely inspected. The welds used to be radiographed, using film. The company converted their Norelco MG 150 installation, using a fractional focus tube with a Norelco image intensifier. Now, the same pipe is inspected while moving at speeds up to 2-3 fpm. Reports show sensitivities on the image intensifier are 2 percent on 0.375 inch steel. Overall sensitivity levels are well within customer requirements.



WELDS in landing gear struts are inspected faster, easier with Triplett & Barton 275 KV unit available from Sperry Products. Unit's head weighs 65 lb.; high KV (up to 300) permits shorter exposures.

COSTS WERE SLASHED 75 percent and manhours cut 80 percent in making spot tests on Fairchild F-27 wings. Fairchild uses Westinghouse's Baltospot 200. Cloth templates pinpoint each shot; 140 are used at $1.90 an exposure.

Here's an example how costs were cut: X-ray testing on the center of the wing requires 57 separate pictures. Using the Baltospot unit, this takes 2½ to 3 hours. Visual checking would require 16 hours and would call for the removal of stress access openings and internal trim.

Circle No. 59 on Reader Service Card.

product defects

getting you down?

let us help you...

- ***find hidden cracks*** with magnetic particle or dye penetrant inspection equipment
- ***find deep-lying defects*** with x-ray or gamma radiography equipment
- ***see "innards" directly*** with bright-image fluoroscopes
- ***work out the method*** at our Industrial Applications Lab

call any local Picker office

where a technical expert is always near (see 'phone book) or write

Picker X-RAY

25 So. Broadway, White Plains, N.Y.

THE COMPANY WITH THE DUAL ROLE!

NON-DESTRUCTIVE TESTING . . .

Complete facilities for testing products, materials and components

- Ultrasonic Thickness Measurement
- Ultrasonic Flaw Detection
- X-Ray, Gamma Ray
- Magnetic & Penetrant
- Chemical & Physical Testing

ELECTROPLATING AND HARD COATING . . .

Fully equipped for metal treating and related industrial finishing operations

HI-T-LUBE

. . . a revolutionary new lubricant designed for use where high temperatures do not permit use of most metal alloy or dry film lubricants.

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BELLEVILLE 9, NEW JERSEY

Territories open — Inquiries Invited

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FILM BADGE MONITORING PROVIDES GREATER SAFETY IN RADIOGRAPHIC OPERATIONS

X-RAY MONITORING OFFERS THE FINEST FILM BADGE SERVICE EVER CREATED TO INCREASE THE SAFETY FACTOR FOR PERSONNEL WORKING IN NUCLEAR AND X-RAY OPERATIONS

ONE LOW SUBSCRIPTION FEE PAYS FOR ALL!

- Written Reports Within 24 Hours
- Cumulative Dosage Reports
- Maximum Protection
- Telephone Notice In Case Of Overexposure
- Complete Peace-Of-Mind

For Further Information, Contact:

X-RAY MONITORING CORPORATION

43 West 61st Street • New York 23, N.Y.

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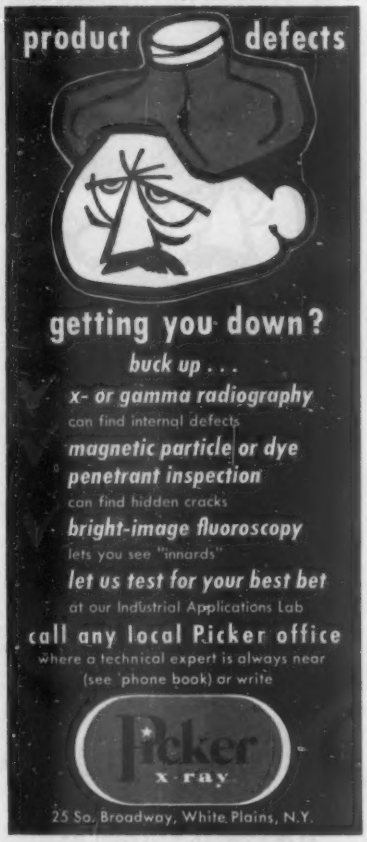
Circle No. 76 on Reader Service Card.


product defects
getting you down?
buck up . . .
x- or gamma radiography
can find internal defects
magnetic particle or dye penetrant inspection
can find hidden cracks
bright-image fluoroscopy
lets you see "innards"
let us test for your best bet
at our Industrial Applications Lab
call any local Picker office
where a technical expert is always near
(see 'phone book) or write
Picker
x-ray
25 So. Broadway, White Plains, N.Y.

Penetrant inspection

PENETRANTS are used to locate surface cracks, porosity, and leaks in nonporous solids: metals, ceramics, glass, and most plastics. They are used in production dip tanks or with portable kits.

ADVANTAGES

Detects extremely minute cracks and leaks. Dye penetrant appears as a deep red on white background; fluorescent penetrant glows brilliantly under black (ultraviolet) light.

Simple, accurate, and fast. Low installation- and per-item cost.

LIMITATIONS

Not effective on subsurface defects.

Surfaces must be free from oil and grease.

A semi-darkened area is necessary for good inspection with the black light. Portable kits required electricity.

FLUORESCENT INSPECTION is used on this aircraft gas turbine compressor stator blade and shroud assembly to detect weld cracking and porosity and avoid breakdown of parts after assembly. Zyglo equipment from Magnaflux Corp. is used.

Another application for fluorescent inspection is in manufacturing automatic washers. Welded tubs are inspected for leaks at a rate of 300 tubs an hour. If tubs with defective welds got through to porcelainizing, porcelain defects would result and cause rejection of completed tubs—an expensive proposition.

DYE PENETRANT is used widely to check tanks for leaky welds. Savings from 50 to 90 percent often result because repairs can be made immediately after welding; tanks do not have to be moved to other departments for tests, or on to slow hydrostatic test jigs.

Even open subassemblies or open tanks are readily tested. Otherwise, expensive jigs and blocking would be required if an air test were to be made.

The open tank above shows Magnaflux Corporation's Spotcheck penetrant and developer applied to the weld seam; red dye spot marks a through-leak.

Photo Courtesy The Lincoln Electric Co.

NOW . . .
ONE AMMETER
for AC/DC WELDERS
Only TONG-TEST
measures both AC and DC

Weld with confidence. Use the exact amperage—no more, no less—to assure welding quality. Prevent costly rejects by controlling the welding current (AC or DC) with one TONG TEST AMMETER. Simply snap tongs around electrode cable — read amps instantly and accurately. No electrical connections required, cannot burn out. Interchangeable ranges up to 1000 amperes.

Write for Catalog IW-400

COLUMBIA ELECTRIC MFG. CO.
4545 Hamilton Avenue • Cleveland 14, Ohio

Circle No. 20 on Reader Service Card.

Are you paying

5 TO 10 TIMES TOO MUCH FOR WELD INSPECTION

.... *and not finding* ***ALL*** *the cracks?*

If you are testing to routine specifications—or applying such specs—it is quite likely that you are paying an unnecessary high price. Certainly it is a possibility worth investigating!

With Magnaflux testing...

you can reliably inspect about 150 feet of linear welds per hour, at a cost of approximately 4.4¢ per foot of weld. This includes man-hour cost for two inspectors working at an *average* rate, plus the small cost of Magnaflux powder used.

For non-linear welds, your cost will be about 50% more—or roughly 6.6¢ per foot of weld, including normal cost and time for moving scaffolding.

Compare these costs with what you are paying now!

How reliable is Magnaflux?

It is the only recognized test proven completely reliable for finding all cracks open to the surface . . . however small or deep. These are the cracks that raise stresses dangerously and cause most of the failures in weldments.

Many manufacturers of X-ray equipment frankly caution that X-ray may not find all these cracks. Yet, these very cracks are most important to find! Nor will *any other method* find them at a cost as low as Magnaflux.

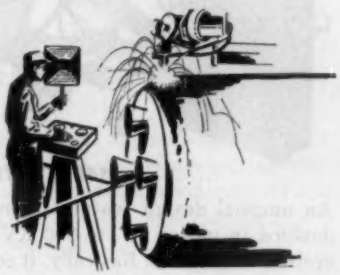
None of this implies that Magnaflux testing eliminates all need for other test methods. Magnaflux *can* cut your testing costs and it *will* find many cracks other methods overlook, and the significant sub-surface defects, as well.

Shouldn't you investigate these savings now? Ask to have a Magnaflux Engineer detail the whole story—soon.

Write or call Magnaflux Corporation, 7348 W. Lawrence Avenue, Chicago 31, Illinois.

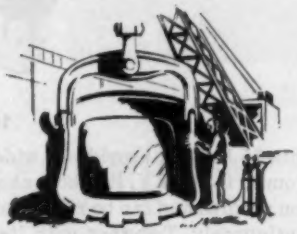
MAGNAFLUX CORPORATION
A SUBSIDIARY OF GENERAL MILLS
General Mills
TEST SYSTEMS

CONSTRUCTION: Bridges, buildings, etc. Magnaflux is proved out on important welds.



SPACECRAFT: Critical welds. Often several Magnaflux and other methods needed—on each weld.

OIL and CHEMICAL: For pipeline, reactor, or tank—welds proved crack-free.



HEAVY EQUIPMENT: Manufacture and Repair. Portable and low cost reliable tests.

For More Information Circle No. 75 on Reader Service Card.

WANT UNSURPASSED QUALITY?

SPECIFY *Norelco*® NON-DESTRUCTIVE TESTING EQUIPMENT

The Norelco Industrial X-ray line is top-quality apparatus specifically designed by leading industrial specialists for industrial use and to yield optimum results in the shortest possible time commensurate with ease of handling. The features of this apparatus are unconditionally superior — resulting in outstanding performance and dependability.

300 KV TRANSPORTABLE

An additional transformer and 300 KV X-ray tubes convert the basic 150 KV unit to a heavy radiographic unit capable of penetrating denser and thicker metal sections. The features of this apparatus indicate how well it has been designed to meet industrial needs.

150 KV TRANSPORTABLE

An unusual design feature permits this unit to be doubled in power . . . to 300 KV output at the discretion of the user. Basically, it consists of a 150 KV constant potential generator with a range of six single cable interchangeable X-ray tubes. Each tube has a distinctive usage.

260 KV PORTABLE

From thin aluminum castings to thick steel welds, this unit offers an excellent field unit which is weatherproofed, economical and capable of unusual positioning flexibility because of its construction. Its small focus insures a crispness of image sharpness. Its output ranges from 60 to 260 KV through a stepless control.

100 KV PORTABLE

This 55 lb. unit provides a wide and variable range from 30 to 100 KV. It is both shockproofed and radiation proofed and can be run at full load for 50 minutes continuously. Together with its control unit, it is a handy on-location X-ray facility.

For More Information Circle No. 79 on Reader Service Card.

140 & 200 KV PORTABLES

This new low and high intermediate portable equipment provides an easy-to-handle high level of penetrating energy in a "suitcase" design unit. Each is unusually lightweight and possesses very small foci which renders unusually excellent radiographic sharpness and detail. Optional water cooling may be employed and a special four-legged tube-stand offers good flexibility in positioning.

ISOTOPE RADIOGRAPHY

Norelco now offers a new and complete line of isotope equipment for low-cost radiography. A wide range of units with different outputs vary from 10 to 1,000 Curies. Camera units provide extended sources for panoramic exposure techniques as well as beam type cameras and are manipulated by cable control for remote operation.

Portable cameras are available which are designed for pipe and small fixture examinations with coned ports for confining beam.

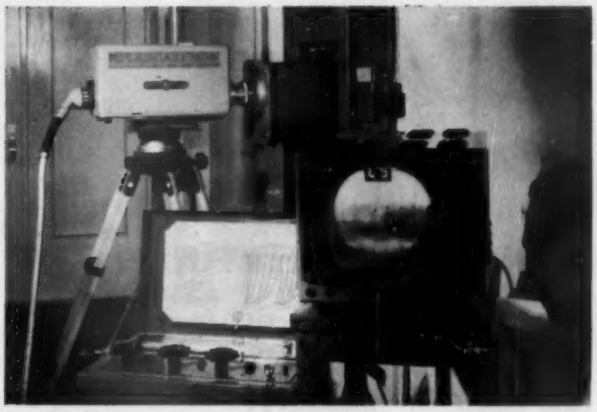
Sources are available in Iridium and Cobalt. When projected free-in-space from the protective housing, a global beam of gamma radiation is provided of equal intensity in all directions.

PORTASPEC X-RAY SPECTROMETER

Normally, the physical size of X-ray analytical equipment precludes its use in field applications. This new portable unit will provide for general assaying, field checking of leaded fuels, identification and sorting of metal stock and many other applications which require on-the-spot checking.

X-RAY IMAGE INTENSIFIER

Basically, this apparatus intensifies the brightness of fluoroscopic images. Its extent of brightness increase makes it possible to use less penetrating energies and also does not result in diminished visual efficiency on the part of the operator. Brightness amplification is as high as 1,000 times. Contrast may be regulated and images may even be transmitted to remote areas by closed-circuit television.



Detailed specifications and construction data on this unsurpassed quality line is available free. Drop us a line today!

PHILIPS ELECTRONIC INSTRUMENTS Norelco

Industrial Radiographic Equipment Division

PHILIPS ELECTRONIC INSTRUMENTS

A Division of Philips Electronics and Pharmaceutical Industries Corp.

750 South Fulton Avenue, Mount Vernon, New York

In Canada: Research & Control Instruments • Philips Electronics Industries Ltd. • 116 Vanderhoof Ave., Leaside, Toronto 17, Ont.

For More Information Circle No. 79 on Reader Service Card.

TO MAKE THE MOST FROM YOUR DISPOSABLE X-RAY FILM

AUCTION IT!

...and invite HANDY & HARMAN to bid

We don't care where it is, how much you've got or what shape it's in, we'll bid on it. Because our bids are based on *complete* recovery of the film's silver value by *burning*, our price is never controlled by seasonal demands. You stand to make more, *all of the time* from the bidder who wants only the silver.

In dealing with the nation's biggest refiner of precious metals, you are assured of prompt payment (usually within a week).

Call or send coupon to the Handy & Harman Refining Station nearest to you for a prompt and profitable bid on X-ray film of any kind in any amount.

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PROVIDENCE 3, R. I. 425 Richmond St. JAckson 1-4100

CHICAGO 22, ILL. 1900 West Kinzie St. SEely 3-1234

Please give me your price on_____lbs. of
☐ Industrial ☐ Medical X-Ray Film

NAME_____

COMPANY_____

ADDRESS_____

For More Information Circle No. 78 on Reader Service Card.

Magnetic particle inspection

MAGNETIC PARTICLE inspection detects cracks that result from fatigue, thermal stresses, gas pockets, lack of fusion, and slag inclusions.

ADVANTAGES

A positive method for finding crack-like defects at or close to the surface. It is flexible, economical, and can be used for production-line inspection. Portable equipment is available.

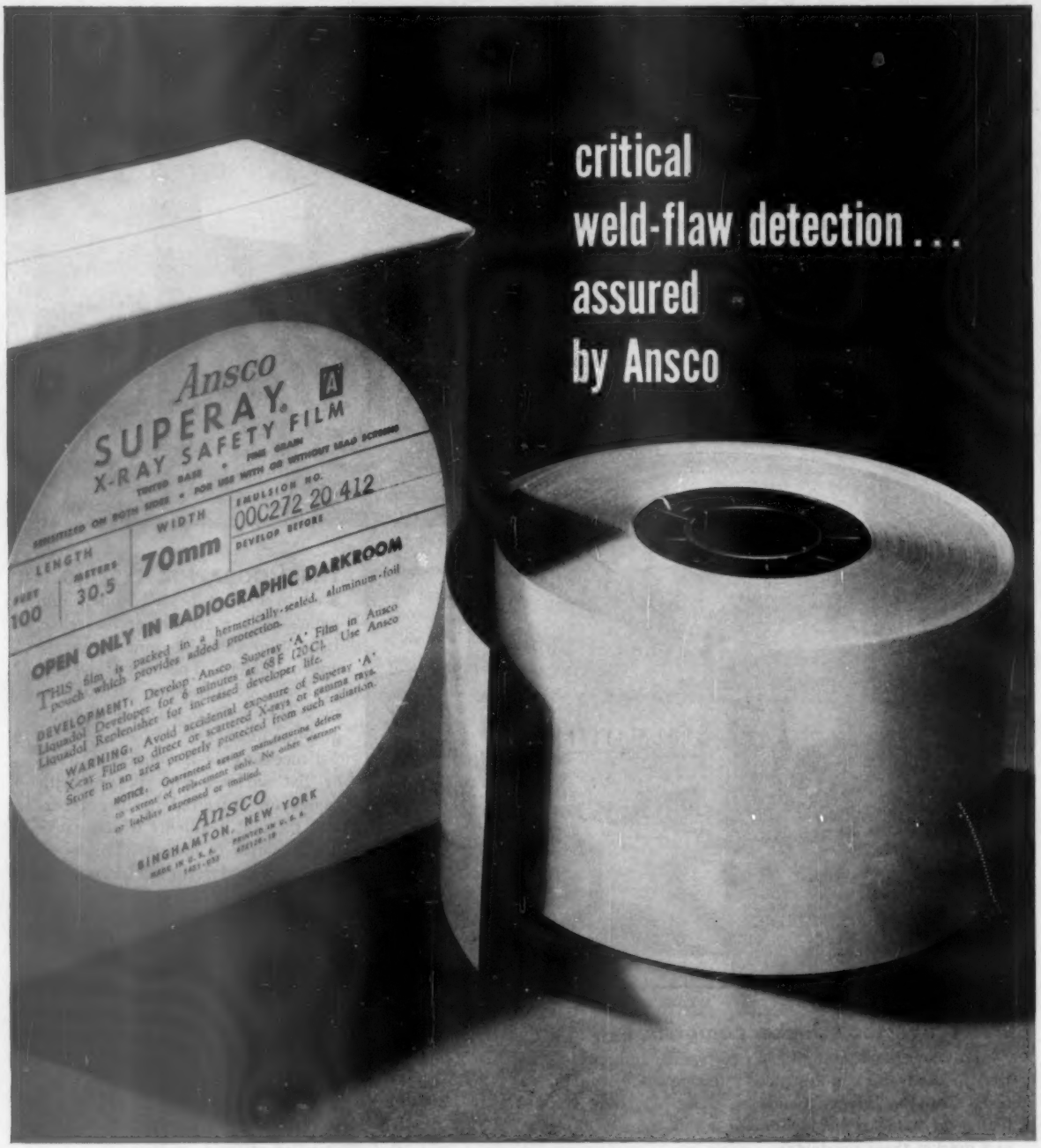
LIMITATIONS

This process is limited to ferromagnetic materials; no indications are apparent for cracks parallel to the magnetic field so magnetism for two directions is needed to find all discontinuities; surfaces must be clean and dry; surface roughness decreases sensitivity; it is not suited for deep-seated small defects.

A DRILLING MAST FAILURE brought about a regular program of magnetic particle inspection with equipment from Magnaflux Corp. As many as 40 fatigue cracks were found in a typical 96-foot portable mast. These were eliminated by grinding, rewelding, and reinspecting. This is done every two years on these masts, which are heavily loaded during hard drilling, lowering, and transporting. The savings? Drilling operations are safer and downtime is greatly reduced.

The inspector and his assistant (above) magnetize a suspect area by holding prods at each end. Magnetic particles are then gently blown over the surface or flowed on in a liquid suspension. Faulty welds often can be discovered even where surface paint has not yet been broken.

In another application, the process was selected over radiographic and hydrostatic testing for inspecting 10,000 feet of multiple-pass butt welds in a wind tunnel. The process detected several cracks not found by the other tests, and did it faster. A 50 to 75 percent savings resulted.



Experienced pipeliners like the uniformity and dependability of Ansco X-ray Roll Films under every condition. They depend on Ansco for easy readability and revealing gradation that clearly detects even the most elusive flaws. For information about how Ansco X-ray Roll Films can solve your inspection problems, fill in and mail the coupon today. Ansco, Binghamton, New York, A Division of General Aniline & Film Corporation.

Ansco
X-ray

Ansco Industrial X-ray Sales
Binghamton, New York
Yes, I want to know all about Ansco Superay X-ray Film!
Name_____
Address_____
Company_____
Position_____

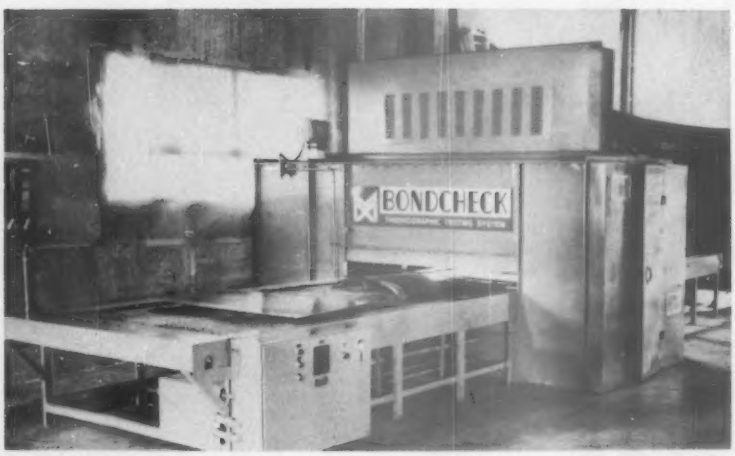
For More Information Circle No. 9 on Reader Service Card.

Here are some other nondestructive testing methods . . .

EDDY CURRENT TESTING is being done more and more with portable equipment like this. Hand-detector coils are used to scan welds for irregular heat-affected zones—critical in many alloys—and for cracks.

These tests save as much as 60 percent over portable indent hardness tests and cover more area. Portable indent hardness tests take twice the time, measure only at certain points, and leave a surface mark.

Here, an uneven heat-affected zone is mapped in welded titanium sheet. The instrument can be used on both magnetic and non-magnetic alloys.



THERMOGRAPHIC TESTING is used to inspect brazed honeycomb panels used in aircraft and missiles. Inspection costs in some cases are approximately 25 percent of the cost of X-ray or ultrasonic techniques; these costs include permanent photographic records.

Processing is automatic. Curved or flat surfaces are sprayed with developer. Infra-red heating generates thermal gradients which cause the developer to migrate. This gives a positive and resin-like permanent indication on the surface of the bond (or lack of bond) beneath the surface.

Don't overlook these companies . . .

Many accessories, auxiliary equipment, and specialized methods for nondestructive testing could not be fitted into the Buyers' Guide on page 53. Here is a listing of some typical companies that manufacture and market these products:

Eddy current testing:
Magnaflux Corporation
7300 West Lawrence, Chicago 31, Ill.

Film accessories:
Equipment for developing and examining radiographic films are available from these companies which make the film. These companies are listed on page 53.

Film badges and service:
Nuclear Advisors, Inc.
33-61 Crescent St., Long Island City 6, N. Y.
X-Ray Monitoring Corp.
43 West 61st St., New York 23, New York

Film salvage:
Handy & Harman
82 Fulton St., New York 38, New York

Penetrameters:
Jem Penetrameter Mfg. Corp.
6 Huron Drive, Natick, Mass.

Safety equipment and clothing:
Bar Ray Products
209-25th St., Brooklyn 32, N.Y.

Testing facilities
General Magnaplate Corp.
331 Main St., Belleville 9, N.J.

Thermographic testing:
Magnaflux Corporation
7300 West Lawrence St., Chicago 31, Ill.

X-ray tubes:
Matchlett Laboratories
1093 Hope Street
Springdale, Conn.

Russia uses these new tests

THE MAGNETOGRAPHIC METHOD of weld inspection is used widely in the USSR on gas mains and other industrial pipelines. A magnetic image of the weld is recorded on magnetic tape and played back by a special unit which has a magnetic reproducing head, an amplifier, and a cathode-ray tube. Just developed is an improved, highly sensitive unit. It differs from earlier models in two ways. First, it has rotating reproducing heads. These greatly increase speed and sensitivity. Secondly, the amplifier signal is fed to the modulator of the cathode-ray tube. This produces a stationary image of the weld similar to that made by radiographic methods.

SMALL-DIAMETER TUBING is tested ultrasonically. Lowering the level of self-induced interferences make it possible to check tubing as small as 10 mm in diameter, with 0.35 to 50.0 mm wall.

A new immersion-type ultrasonic testing is used on thin-wall tubing and other thin parts. Tests show this unit, which utilizes so-called free waves, can detect flaws only 0.05 mm deep.

An attachment added to an existing immersion-type detector increases the energy of ultrasonic vibrations. This makes it possible to use the detector to inspect sheet, plate, and other hot-rolled products without special surface preparation.

THERMAL EXPANSION of metal occurring as a result of current passage is used for testing seam welds and for automatic control of seam welding when the thickness of welded parts and the welding speed do not exceed certain values. A special hydroelectric device was used to measure and record the magnitude of the thermal expansion in seam welded AISI steel pipes 35-36 mm in diameter with an 0.4 mm wall thickness. In the case of a high quality weld (one with a thickness of the fused zone equal to 50-60 percent of the total thickness of the welded parts) the thermal expansion is 7-9 percent of the total thickness. Lack of fusion is indicated by a lesser degree of thermal expansion.

TENSILE TESTS are being used to inspect resistance welded butt joints in pipe. The method is based on the assumption that absence of internal defects in a weld make its tensile strength higher than the base metal because the weld thickness is greater than the welded part. By measuring strains at several points in the weld and in the base metal of the welded part under tension within the elastic range, it is possible to determine the quality and strength of the weld in relation to the base metal.

For More Information Circle No. 48 on Reader Service Card.

EASY . . .
ALL MATERIALS IN SPRAY CANS

FIRE-SAFE . . .
or Chlorine-Free Formulas—SPECIFY

SPOTCHECK SAVES YOU MONEY!
Finds cracks and defects *you can't see*. Finds the cause of in-plant rejects and costly returns later. Simple, positive, fast, easy! Low-cost Spotcheck ends visual guesswork about defects open to the surface in any solid, nonporous material or part. Just spray it on from Spotcheck push-button cans. Cracks and defects open to the surface "pop" out bright red against white background. You can't miss them! Used and preferred in *thousands* of plants over other dye penetrant tests.

COMPLETE SK-3 KIT only $36.00

2 spray cans Penetrant, 2 spray cans Developer, 4 spray cans Cleaner-Dye Remover, instructions, cleaning cloth, wire brush. Steel CABINET-CARRYING CASE. Specify FIRE-SAFE or chlorine-free materials.

Prices: Continental U.S.A. only and Hawaii. F.O.B. our plant, Chicago, Illinois, plus local taxes.

Order From Your "AIRCO" DEALER — or direct
MAGNAFLUX CORPORATION
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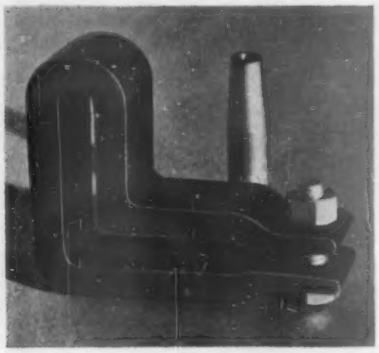
Get the lion's share of meaty facts out of this issue of WELDING DESIGN & FABRICATION before you pass it along to the next reader. Leaf through once more: If you want full details on any item, the Reader Service Card will bring them to you quickly. No postage needed.

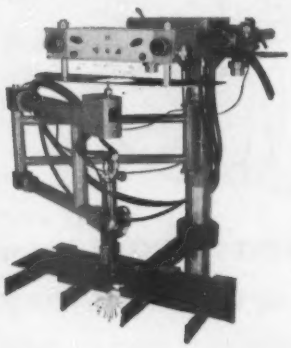
with a Heath Ultra-Graph

Cutting reduces short run costs



This clamp, designed to slide on 2"x2"x3/8" angle, illustrates the economy of controlled flame cutting. A Heath Ultra-Graph was used to cut a short run of clamps from 1" flat steel at less cost than possible by casting or machining. Using the angle as a pattern, light gauge metal strip was formed to the shape of the clamp. Tracing around this simple template, the Ultra-Graph cut each clamp in less than 3 minutes with clean sharp edges and a smooth surface finish. No additional finishing was required.

Factors that add up to savings: operating costs are low, fabricating time is short, cutting is of high quality, and flat steel never becomes obsolete inventory. Send now for more information on cost reduction with Ultra-Graph machines or see your Welding Supply Dealer for a demonstration.

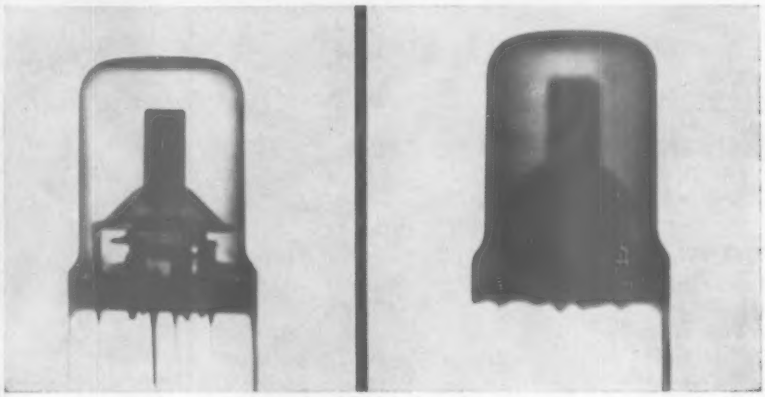


HEATH ENGINEERING COMPANY

P. O. BOX 821
FORT COLLINS, COLORADO

Circle No. 38 on Reader Service Card.

NEW PRODUCTS



New X-Ray Technique Yields Larger, Clearer Pictures

Picker X-Ray Corporation's new X-ray image amplifying techniques increases by five times the previous limits of effective fluoroscopic magnification and yields a clearer picture, the company says.

The Picker Industrial Image Amplifier permits fluoroscopic images to be expanded effectively 20 times original size onto a television monitor or screen, compared with four times previously possible, according to John A. Reynolds, Picker's technical director. The device also is said to produce images 1,000 times brighter than a standard fluoroscopic screen.

The "Super Magnification" technique was obtained by using a high-powered X-ray tube with a tiny, concentrated, focal spot. The angles of the X-ray striking the object being inspected are reduced. This yields increased image sharpness and magnification.

The technique is liked to a flashlight (X-ray tube) with a concentrated, powerful beam sending light (X) rays over a greater distance after hitting the object to be seen (X-rayed). This contrasts with a flashlight with a wider, weaker beam sending rays over a shorter distance.

Circle No. 200 on Reader Service Card.

CO_2 arc welding of mild steel

No special equipment is necessary for welding mild steel by a new welding process introduced by Air Reduction Sales Corp. The new process combines the use of carbon dioxide and a low alloy steel welding wire. Called Aircomatic CO_2 Sprayarc, it produces a quiet, spatter-free arc for a quality weld when using the new specially treated A602 Aircomatic wire. The process produces a 1/8 inch long visible arc at 32 volts, to deposit 7 to 15 pounds per hour depending on wire size and amperage. Deposit tensile strength is 70,000 psi; yield strength, 60,000 psi.

Circle No. 201 on Reader Service Card.

"DON'T ASK AMERICA WHAT SHE CAN DO FOR YOU, INSTEAD ASK WHAT YOU CAN DO FOR AMERICA."

from President Kennedy's Inaugural Address

WE AGREE

American Brazing Alloys Corp. pledges to cut costs and to cut profits for TREMENDOUS PRICE SAVINGS on our alloys

MADE IN AMERICA
BY AMERICAN CRAFTSMEN
IN AN AMERICAN FACTORY

low fuming bronze · nickel silver · silver solder · phosphor copper · phosphor silver · silicon bronze · deoxidized copper · nickel bronze

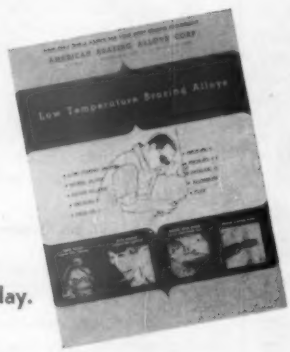
All alloys made in strict accordance with ASTM, AWS and federal specifications

We fully guarantee all alloys to be of the finest quality available at tremendous price savings

SAMPLE OFFER

5 lbs.	1/8	Low Fuming Bronze	@ .65 per lb.
5 lbs.	1/8	Silicon Bronze	@ .77 per lb.
5 lbs.	1/8	Deoxidized Copper	@ .68 per lb.
5 lbs.	1/8	Nickel Bronze	@ .68 per lb.
5 lbs.	1/8	Nickel Silver	@ .87 per lb.
5 lbs.	1/8	Phos Sil 0	@ 1.90 per lb.
5 lbs.	1/8	Phos Sil 2	@ 2.30 per lb.
5 lbs.	1/8	Phos Sil 6	@ 2.83 per lb.
5 lbs.	1/8	Phos Sil 15	@ 4.10 per lb.

1/16 — add .15 lb. 3/16 — subtract .02 lb.
3/32 — add .08 lb. 1/4 — subtract .04 lb.



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May we quote you on quantity purchases?

Do you run into delayed deliveries on foreign rod?	Not with Ambraze
Do you find variations in quality?	Finest quality at Ambraze.
Do you need technical help?	Just call Ambraze.
Are you concerned about competitive prices?	Ambraze has the lowest prices.
Do you want American made alloys?	Ambraze has them.

Dealer inquiries invited

American Brazing Alloys Corp.

Booth 630
AWS Show

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YOUR Resistance Welding Electrode NEEDS Are OUR Business!

Whether it be:
TIPS:
ROD or BAR:
SEAM WELDING WHEELS:
FORGINGS:
CASTINGS:
HOLDERS:
ADAPTERS:

SPECIAL WELDING DIES or FIXTURES: TIPALOY *has them.*

BUY TIPALOY and save money!

TIPALOY can supply you with:
RWMA Class #1, Tipaloy #100
RWMA Class #2, Tipaloy #130*
RWMA Class #3, Tipaloy #200
and other RWMA classes of alloys to fit your needs.

It is unwise to pay too much, but it is worse to pay too little!

Use TIPALOY and get 30% to 100% more performance for your money than you are now getting.

BUY TIPALOY and get TIPALOY QUALITY

Send your trial order today

*TIPALOY #130 cast and processed under our patents.

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Circle No. 67 on Reader Service Card.

Torch and Gun

A new welding gun, AM-7, and automatic torch, A-10, have been announced by National Cylinder Gas Division of Chemetron Corporation. The gun, for all MIG and carbon dioxide-shielded welding processes, has an adjustable pistol grip. The torch, for MIG and TIG welding, can be mounted singly or in tandem. The two have an interchangeable barrel that always runs cool.

Circle No. 202 on Reader Service Card.

Metal-Cutting Electrode

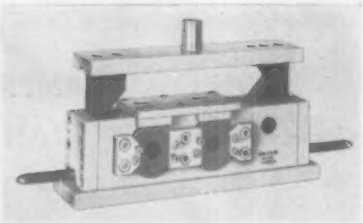
A modified, Eutec-Chamfer-Trode electrode that will now work equally well with a.c. or d.c. welders, has been developed by Eutectic Welding Alloys Corp. The new electrode gives a high-velocity blast to remove metal melted by its arc. It can be used for metal gouging, chamfering, beveling, and grooving.

Circle No. 203 on Reader Service Card.

Chipping Hammer

A chipping hammer with a heat treated head has been announced by Chicago Manufacturing & Distributing Co. The Swing-Balance hammer can be sharpened right down to the handle. The hammer balance will change with sharpening, but so gradually as to be unnoticed.

Circle No. 204 on Reader Service Card.



Slotting and Notching

The new Arc-Twin Tandem which makes four notches in pipe or tubing with one stroke, is announced by Vogel Tool & Die Corporation. Two tubes or pipes can be double notched at both ends. The unit shears from the inside out, leaving clean edges. It can make T's, flared, or long narrow slots.

Circle No. 223 on Reader Service Card.

Homogenized Flux

A homogenized production silver-brazing flux for torch, furnace and induction brazing on stainless, nickel alloys, copper, brass, bronze, steel, and berrylium-copper and all silver alloys is announced by All-State Welding Alloys Co., Inc. Brazalloy S-200 has an active range between 600°F and 1800°F. It has unlimited shelf life.

Circle No. 224 on Reader Service Card.

Vacuum Dry Box

A portable vacuum dry box for welding in rare- or inert-gas atmospheres, or with poisonous or explosive materials, has been developed by the Controlled Atmosphere Enclosures Mfg. Co. This dry box can be evacuated to 50 microns with a leak rate of 1 micron a minute. Because of the box shape, several people can work at once.

Circle No. 225 on Reader Service Card.

Heat Treating Unit

A portable, two-in-one, induction and resistance heating unit has been designed by Electric Arc, Inc. Called the Smith-Dolan Model BHDRS, the 80-kva unit will stress relieve welds in 2- to 14-inch pipe having wall thicknesses up to 2 inches with each of its two 40-kva sections.

Circle No. 226 on Reader Service Card.

the fastest, safest and surest way to... a Leakproof Hose Connection

See Your Distributor
or write direct for catalog and prices

The Sign of a GOOD Hose Clamp

PUNCH-LOK Company

Dept. X, 321 N. Justine St., Chicago 7, Ill.
Circle No. 57 on Reader Service Card.

Automatic Pipe Welding

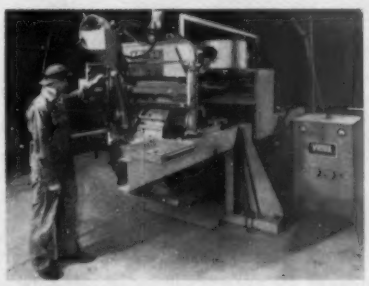
A new process for roll butt welding of pipe, without backup ring or first-pass manual stringer bead, has been announced by Hobart Brothers Co. Called Microwire welding, process uses carbon dioxide shielding while laying in a stringer bead automatically. Process uses 0.200-to 0.045-inch wire, at 16 to 20 volts and 30 to 150 amps d.c., reverse polarity current.

Circle No. 205 on Reader Service Card.

Nickel-Silver Brazing Alloy

A nickel-silver brazing alloy for use in place of silver solder has been announced by American Brazing Alloys Corp. This alloy is used on metals like steel, chrome-moly, stainless, hi-speed steels, and malleable iron. The alloy has these features: it works at 1700°F., the 160-170 Brinell deposit resists corrosion, it has high shear and tensile strength.

Circle No. 206 on Reader Service Card.



Grouser Bar Welder

An automatic welding machine for rebuilding tractor grouser pads has been announced by Victor Equipment Co. The machine handles all lengths and widths of track without disassembly. The completely automatic machine flame trims the grouser bar to be reconditioned and holds the new bar in place while it is welded.

Circle No. 207 on Reader Service Card.

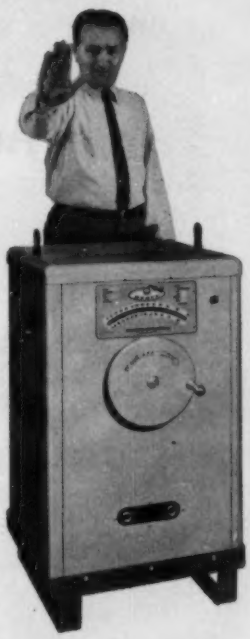
Cutting and Forming Machine

A new steel sheet and plate power cutter and former has been announced by Hedstrom Tool Co. The machine comes in capacities that can cut 1/8 inch through 25/64 inch. Model MT-4 (shown) will cut 3/16-inch steel with its 39-inch throat. The machine cuts all shapes in flat, curved, or corrugated sheet.

Circle No. 208 on Reader Service Card.

STOP

...variations in arc stability



M&T Murex AC
Industrial Arc Welder

Has patented dual-coil transformer with balanced electrical circuit • Promotes smooth, steady arc under all welding conditions • Glass insulated windings add to transformer life • Rigidly, permanently mounted chatter-free shunt • Single inch of shunt travel adjusts for entire output current range • Write for data sheet that tells you more.

M&T MUREX welding products

METAL & THERMIT CORPORATION
General Offices: Rahway, New Jersey
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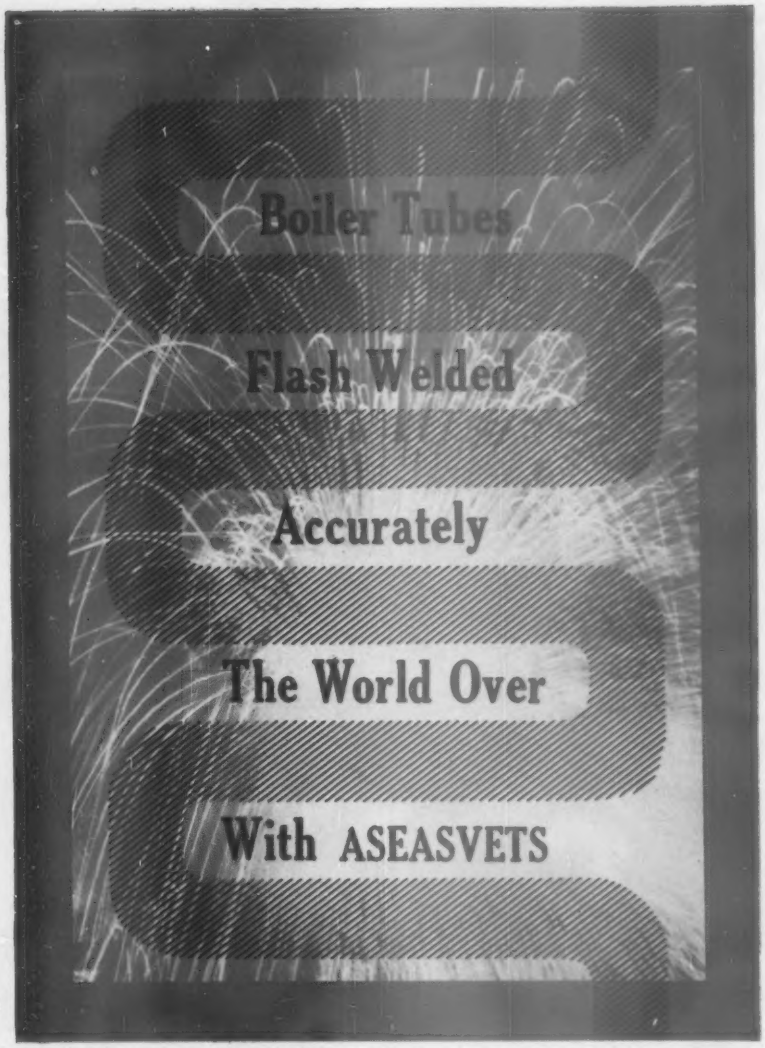
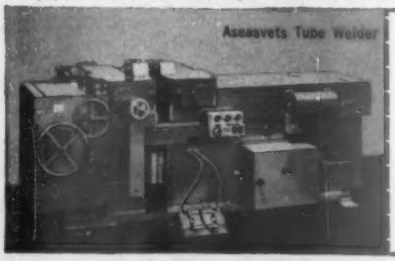


The ASEASVETS Tube Flash Welder, world renowned for accuracy, includes automatic internal flash and upset reduction in preformed tube elements. Elements with tube spacings down to ½ inch can be welded. The ASEASVETS Boiler Tube Welder takes M.S., Cr. Mo., Stainless Steel and many others. Welders are complete with hydraulic clamping equipment, motor operated pre-heating, flashing and upsetting. Maximum welding surface up to 6 sq. in.; max. clamping force 30 tons; max. upsetting force 20 tons; max. O.D. up to 7". Also from ASEASVETS: Chain Welders—complete mills or individual units. Seam Welders—foot and air operated machines for steel, stainless steel or non-ferrous metals. Projection Welders—for production welding of small and medium sized parts. Spot Welders—highly economical for materials usually soldered or riveted. Resistance Heaters—for bolt blanks. Electrodes—Ordinary electrodes and electrodes with unusually deep penetration. Send coupon for free literature.

ASEA



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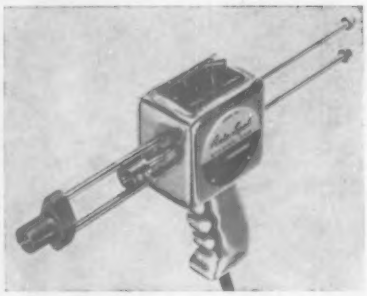


Arc Spot Weld Gun

A two pound spot welding gun, announced by Bren Weld Corporation, comes with its own power supply. Pressing the unit, called Automatic Arc Spot Gun (Model 90), against the work starts the arc and feeds the electrode; then the unit shuts off and resets—automatically. Unit welds 26- to 12-gage sheet from one side.

Circle No. 83 on Reader Service Card.

Welding Timer

An instrument for recording the operating time of a welder on a paper tape is available from Weld-Record Corp. Instrument has time-printed chart rolls that are marked by a ball point stylus to tell, at a glance, the OFF and ON time recorded. Weld-Record also has a meter that tells total welding time.

Circle No. 209 on Reader Service Card.

Stored Welding Power

A stored energy power supply has been developed by Hughes Aircraft Company. The VTW-30 delivers step-free, adjustable power from 0.5- to 100-watt-seconds. A pulse width of less than 1½ milliseconds prevents burning of the weld area.

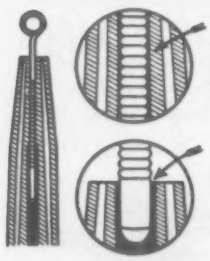
Circle No. 210 on Reader Service Card.

Let Your Local Welding Supply Dealer Explain Why "YOU GET SO MUCH MORE" *With . . .*

WYPO
Wipes and Polishes
the World's Finest
CUTTING & WELDING TIP CLEANERS

FREE! NEW, SPECIALLY DESIGNED WYPO POLISHING FILE INCLUDED IN EACH SET

More Exclusive WYPO Features



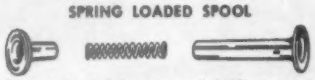
These rounded outer edges of cleaning ridges clean and polish tip orifice without scratching or cutting.

This smooth pilot guides WYPO Tip Cleaner into tip. Will not enlarge or damage tip port.

This cross section view of WYPO Cleaning Surfaces shows these exclusive features: Rounded cleaning surfaces that won't jam or cut.

Straight sided valleys insure thorough cleaning by removing all waste.

SPRING LOADED SPOOL



Spring loaded brass spool. Will not rust. Holds cleaners securely in case.

DOUBLE WOUND EYES

Insures longer life for small sizes of WYPO Tip Cleaners. Will not pull out of case.

STAINLESS STEEL POLISHING FILE

Specially designed WYPO File furnished free in each set

NOW AVAILABLE IN 3 CONVENIENT SETS

WYPO TIP CLEANERS
STANDARD SET

CLEANER NO.	FOR DRILL
7	73-74
8	73-71-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49

S. S. WYPO FILE MADE IN U.S.A. PAT NOS 2629581, 2673758 IN CANADA 1948

STANDARD SET OF (12) Cleans (27) Drill Sizes Nos. 75 to 49 Incl.

WYPO TIP CLEANERS
JUMBO SET

CLEANER NO.	FOR DRILL
28	48-47
30	46-45
32	44-43
34	42-41
37	40-39-38
39	37-36
42	35-34-33
44	32-31
45	30

S. S. WYPO FILE MADE IN U.S.A. PAT NOS 2629581, 2673758 IN CANADA 1948

JUMBO SET OF (9) Cleans (19) Drill Sizes Nos. 48 to 30 Incl.

MASTER SET
WYPO TIP CLEANERS

CLEANER NO.	FOR DRILL
7	73-74
8	73-72-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49
28	48-47
30	46-45
32	44-43
34	42-41
37	40-39-38
39	37-36
42	35-34-33
44	32-31
45	30

S. S. WYPO FILE MADE IN U.S.A.

MASTER SET OF (21) Cleans (46) Drill Sizes Nos. 75 to 30 Incl.

Replacement cleaners and files available. Cleaning Range— Cleaner No. & Drill Nos. stamped on back of each case. WYPO GIVES YOU MORE!

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Circle No. 49 on Reader Service Card.

Stainless Welding Wire

Tubular composite wire for welding stainless by automatic and semi-automatic processes has been developed by Stoody Company. The wires, consisting of a balanced alloy core in fabricated steel tube, are available in 3/32-, 7/64-, 1/8-, 5/32-, and 3/16-inch diameters. Depending on size, wires come in 25-pound spools, in 25-, 50-, and 100-pound coils, and in 200- and 500-pound drums.

Circle No. 211 on Reader Service Card.

Improved Goggle

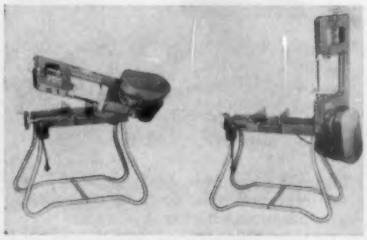
Flexible mask goggles have been improved by American Optical Co. to make them safer and more comfortable. Features include: greater ventilation, snap buttons to hold lens securely in frame, quickly removable lens, and capability to fit over prescription or safety glasses.

Circle No. 212 on Reader Service Card.

Electrode Packaging Machine

A new machine, developed by Machinefabriek P. von Houten, Holland, packs 14- or 18-inch electrodes in cartons, and seals and labels them at the rate of 12 cartons a minute. Available for export to the U. S., unit is a little under 18- x 12- x 5-feet.

Circle No. 213 on Reader Service Card.



Metal Cutting Band Saws

A compact, dual-purpose metal cutting saw has been announced by Wells Mfg. Corp. It can be used as a horizontal cut-off saw or, as an upright band saw. Called Model 300, unit will cut 3½ x 6-inch rectangular shapes, 3½ inch diameter rounds, and 3-inch pipe. It has a 115 volt, ¼ H.P. motor with a "V" belt drive. Blade speeds of 54-, 100- and 190-feet per minute.

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LOOK

. . . at this "Jack of all welding jobs"

M&T Murex Muretran* All-Purpose Welder

Most versatile welder ever developed • Instant changeover to manual, automatic, inert-gas spot, MIG and TIG welding • Unique plug-in timers for gas pre-flow, post-flow, high frequency drop-out, spot arc • Patented, dual coil windings in saturable shunt transformer • Sealed silicon rectifiers assure highest efficiency, long life • AC-DC or AC models • Write for data sheet.

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M&T MUREX **welding products**

METAL & THERMIT CORPORATION
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For More Information Circle No. 18 on Reader Service Card.

THE CMD®
chipping hammer
WITH
SWING BALANCE

This is the hammer with the balanced feel—swings easy, fits the hand properly, absorbs shock. *Less fatigue* and it's a pleasure to use!

CMD heads are made of ¾" square tool steel. They can be re-sharpened right down to the shaft!

Type A 20 oz., drift and right angle chisel.
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TYPE A TYPE C

WELD STAINLESS FASTER!

Use **AIRCOMATIC®**—Airco's gas shielded metal arc process. Terrific on austenitic plate ⅛" and over. For unbiased advice on any stainless application, call Airco—the only producer of complete equipment for Aircomatic, Heliwelding and stick electrode welding.

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Circle No. 2 on Reader Service Card.

Magnetic Ground Clamp

On and Off in seconds . . . No awkward clamps, screws or springs needed to hold ground to work.

Rugged aluminum body makes for improved electrical contact; ground remains cooler, thus increasing efficiency of welder.

A great time-saver . . powerful, long-lasting built-in Alnico magnets produce a vise-like grip that holds the ground hog to work in any position . . . on flat, round or angular surfaces.

LIST EACH $7.95

Distributor territories still open.

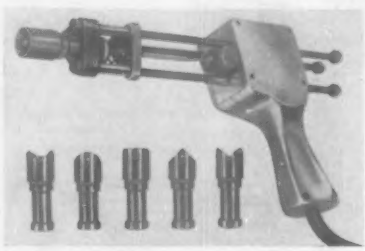
MAGNE CAST TOOL CO., Inc.
4614 WEST 5TH AVE. • CHICAGO 44, ILL.

Circle No. 47 on Reader Service Card.

X-Ray Reproduction

A new device that rapidly reproduces radiographs is offered by the Copymate Co. The Copymate is desktop size and will handle sheets 14 inches in width and of any length. It will make radiograph copies in one minute on paper or film.

Circle No. 215 on Reader Service Card.



Electric Arc Gun

One gun for spot welding, stud welding, tack welding, button welding, hole burning and riveting, has been developed by Beeco Mfg. Corp. Called the Beeco Six Shooter, gun works off any a.c. or d.c. power source. This lightweight, portable gun welds all shapes without a backup.

Circle No. 216 on Reader Service Card.

Pneumatic Nibbler

A lightweight, portable, pneumatic nibbler has been announced by Newage Industries, Inc. Features of the Desoutter nibbler are: it cuts .064 inch steel, weighs only 3 pounds, turns on a 1 inch radius, cuts at a rate of 6 feet a minute and guaranteed for 12 months.

Circle No. 217 on Reader Service Card.

Circle No. 10 on Reader Service Card.

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ARCAIR FLEX AIR MOVER

Arcair jet pump type air mover — the quick, low cost way to exhaust foul air fumes and dust from closed and poorly ventilated work areas. It has simple maintenance-free design, high velocity performance, low noise level. Write today for complete details . . . or see your welding supply distributor.

THE *Arcair* COMPANY

Bremerton, Washington
429 S. Mt. Pleasant St., Lancaster, Ohio

ARMSTRONG

SPATTER RESISTANT . . . .

Welder's

C-CLAMP with the New Ball-joint Swivel Pad

that can't come off

These finest welder's clamps have every quality and convenience feature: Extra deep throat. Extra stiffness and strength—drop forged steel, heat treated. Cadmium plated *all over*—spatter resistant. Drilled for ground. And, the exclusive, ARMSTRONG 1-piece, formed-on swivel pad that can't work, pry or knock off. 8 sizes: capacities to 12" opening. Specify ARMSTRONG Spatter Resistant Welder's "C" Clamps for safe, lifetime service. There are no better.

Write for Catalog

Armstrong Bros. Tool Co.

5262 West Armstrong Ave. • Chicago 46, Ill.

Circle No. 11 on Reader Service Card.

Diffusion Bonding

A new technique for joining copper to itself, and to other copper alloys, has been developed by the Chase Brass & Copper Co.

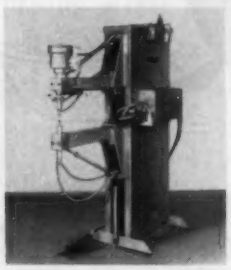
Parts to be joined are coated with a bonding agent, then heated for five to fifteen minutes in a hydrogen or inert atmosphere between 1,700 and 1,800F. During heating, the coating diffuses into the parts joining them with a homogeneous bond which is as strong or stronger than the base metal.

Circle No. 218 on Reader Service Card.

AC-DC Welders

A new gasoline engine-driven welder has been announced by National Cylinder Gas Division of Chemetron Corporation. Ratings for the Sureweld Model SGAD-225-L are 300 amperes at 30 volts a.c., or 225 amperes at 30 volts d.c. The compact unit also produces auxiliary power.

Circle No. 219 on Reader Service Card.



Spot Welder

The first in a new line of economy welders has been announced by Progressive Welder & Machine Co. The spot welder is a compact, stripped-down model with transformers available in 20- to 75-KVA. Tubular upper arm acts as a close-coupled surge tank to give fast air cylinder recovery for constant, rapid stroke action. Machine will weld work thicknesses of 22 gage to ⅛ inch. Throat depth is adjustable from 12- to 39-inches; height, from 12- to 18-inches.

Circle No. 220 on Reader Service Card.

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Offers best type of rectifier for this service: non-aging silicon diodes—hermetically sealed • Assure long life, extremely dependable operation, as much as 98% efficiency • Machine designed for instant recovery voltage: arc easily struck, stabilized, maintained • Easy settings: simple selector and knob control for current range, polarity • Write for data sheet.

M-T MUREX welding products

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WEST COAST DIV: HUNTINGTON PARK, CALIF.
SOUTHWEST DIV: GARLAND (DALLAS COUNTY), TEXAS
RW-38

For More Information Circle No. 8 on Reader Service Card.

REFERENCE DATA

catalogs, handbooks, manuals

CASE HISTORY REPORTS on the successful use of welding electrodes in three different industries are featured in 8-page Bulletin A-3 offered by McKay Company. The Bulletin also lists 10 other technical charts and catalogs available on welding and surfacing.

Circle No. 300 on Reader Service Card.

NONDESTRUCTIVE TESTING services are available on a day-to-day basis or single job order from General Magnaplate Corp. Literature available from the company describes seven different types of nondestructive testing equipment available.

Circle No. 32 on Reader Service Card.

NONDESTRUCTIVE TESTING equipment for X-ray and gamma ray inspection are feautred in literature from the Industrial Radiographic Equipment Division of Philips Electronic Instruments. Detailed specifications and construction data is given.

Circle No. 79 on Reader Service Card.

PIPEWELDERS' SPECIAL is introduced in literature from Smith Welding Equpiment Corp. It's a combination welding-cutting-heating outfit designed specifically for the pipewelding industry.

Circle No. 81 on Reader Service Card.

BRASS FITTINGS for the welding industry are described and illustrated in a 20-page catalog from Westren Enterprises, Inc. Complete specifications are given for over 200 different fittings and connections.

Circle No. 71 on Reader Service Card.

CONTROLLED FLAME CUTTING and how it reduces short run costs is explained in literature from Heath Engineering Co. Described and illustrated is the company's Ultra-Graph flame cutting machine which uses simple, ease-to-make patterns.

Circle No. 38 on Reader Service Card.

EUTECTIC's Report on the State of the Arc: CAST IRON

"QuenchWeld" Process for heavy sections now even further improved

• New advance from EUTECTIC's research: highly acclaimed, field-proven "QuenchWeld" Process now has been further improved in the labs! What it means to you: an even better joint, even easier to weld. Simple as A-B-C: vee out crack and make stress relieving grooves with QuenchWeld Electrode A; butter entire surface with QuenchWeld Electrode B; make final joint, quenching with air blast or wet cloth after each pass, with QuenchWeld Electrode C. No pre-heat needed; big savings in time!

...and 3 more companions for the cast-iron weldor

Xyron® 2-23 (AC-DC Reverse): an all-around, all-position electrode specifically recommended for cast iron applications demanding ultimate crack resistivity, such as pressure chambers, pump housings, valves, or any type of casting involving hydrostatic pressure.

Xyron 2-24® (AC-DC): another all-around alloy, specially recommended for in-position "cold" arc welding of thin sections, long cracks, filling defects, etc., where maximum machinability is required.

Xyron 2-25® (AC-DC Reverse): again, a general-purpose electrode with special properties. This is recommended for high-strength alloyed cast irons as well as ductile irons, "Meehanite," nodular, and malleable irons and special grades.

Whatever your application, cast iron or other, look to EUTECTIC for the most advanced alloys and personal service on-the-job, anytime, anywhere, at no cost or obligation.

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For More Information Circle No. 29 on Reader Service Card.

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Sold separately, these components would list at a total price of $134.94—still a good buy, considering the top quality that "Purox" stands for. But with this "Four Nines" kit, you get a complete outfit for welding, cutting, heating, and brazing . . . all first-quality materials at a budget price. The "Four Nines" Outfit includes a welding torch with three heads, cutting attachment with one nozzle, oxygen and acetylene regulators, 12½ feet each of oxygen and acetylene hose with fittings, friction lighter, and goggles.

See it at your LINDE distributor's. Or, write for literature to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada*, Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

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For More Information Circle No. 74 on Reader Service Card.

"SPECIFIC PROBLEMS Associated with Oxygen Cutting of Bevels" is the title of an article reprint issued by Air Reduction Sales Co. Included are charts and graphs on preheating, bevel cutting techniques, and the use of common fuel gases.

Circle No. 303 on Reader Service Card.

PIPE LAYOUT equipment is described and illustrated in literature available from Contour Sales Corporation. Equipment is shown in typical applications.

Circle No. 21 on Reader Service Card.

X-RAY FILM EXPOSURE calculators for either Co60 or Ir192 radiography of steel are available from The Gevaert Company of America, Inc. The calculators' pocket size makes them easy to carry and use.

Circle No. 33 on Reader Service Card.

AUTOMATIC flame cutting machines are illustrated in a brochure available from the Heath Engineering Company. The brochure explains the operating techniques that make these machines most efficient for short runs.

Circle No. 38 on Reader Service Card.

FILM BADGE SERVICE for persons working in nuclear and x-ray operation is explained in literature available from the X-Ray Monitoring Corp. Subscription fees, notices and reports are discussed.

Circle No. 72 on Reader Service Card.

LOW TEMPERATURE brazing alloys are listed in a catalog available from American Brazing Alloys Corp. Illustrations show the applications of different fluxes with different metals. Charts give the composition by percent for all alloys available. Fluxes are also available.

Circle No. 6 on Reader Service Card.

X-RAY INSPECTION equipment of all sizes are featured in literature from the X-Ray Department of General Electric Company. Solving unusual inspection problems with the many facilities of G-E is described and illustrated.

Circle No. 31 on Reader Service Card.

AN AUTOMATIC TORCH (NCG A-10) for MIG and TIG welding and a semi-automatic welding gun (AM-7) are described in Bulletin NH-14 available from National Cylinder Gas Division of Chemetron Corporation. The gun and torch have interchangeable barrels and diagrams show how the gun is fitted with an adjustable pistol grip and the torch can be mounted single or in a standard mount holding two torches for parallel or tandem welding. Features of both units are listed.

Circle No. 304 on Reader Service Card.

"PRESS BRAKE DIES and Their Forming Use" is the title of a 134-page book published by Dreis & Krump Mfg. Co. The book's 11 sections cover the design and use of dies for bending, forming and punching. A copy is available to those who request it on their company letterhead.

AIR-POWERED grinders and new safety valves used on 6- and 8-inch grinders are described in a folder from Thor Power Tool Co. The safety valve is one feature of Thors 5G and 6G models, which develop up to 100 percent more horsepower than the company's preceding straight grinders.

Circle No. 306 on Reader Service Card.

A NICKEL-BASE brazing alloy for joining stainless surfaces with large clearances is described in an engineering data sheet from the Stainless Processing Division of Wall Colmonoy Corp. The data sheet describes W. G. Nicrobraz, lists its engineering and brazing properties, and illustrates case histories.

Circle No. 307 on Reader Service Card.

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For More Information Circle No. 42 on Reader Service Card.

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A telephone call will prove the point. Look up your LINDE distributor in the classified directory. Or write to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada,* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

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Circle No. 46 on Reader Service Card.

For More Information Circle No. 41 on Reader Service Card

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For More Information Circle No. 35 on Reader Service Card.

Welding Show Moves To New York

NEW YORK CITY: The American Welding Society will hold its 42nd annual Convention and Welding Exposition and act as host to the International Institute of Welding here on April 10-21.

The IIW will meet April 10-15 at the Sheraton-Atlantic Hotel and will remain for the AWS Meeting and Welding Show which will take place the following week. AWS Technical Meetings will be held in the Commodore Hotel, April 17-21, and the Welding Show in the New York Coliseum, April 18-20.

AWS Sections Sponsors Kansas Welding Show

WICHITA: A Welding Show and Exhibit is being presented on March 24 and 25th by the Wichita Section of the American Welding Society. Live displays and demonstrations by manufacturers will bring the latest in welding equipment, processes, and allied metals, materials, and services to Kansas welding users.

Structural Fabricator Adds Welding Department

ST. LOUIS: Completion of a new 40,000-square-foot weldment department addition to Stupp Bros. Bridge & Iron Co. facilities here has been announced by Erwin P. Stupp, president. He explained the addition will make possible increased production of weldments and welded structures.

THIS NEW OFFICE BUILDING has been completed by Hammer Blow Tool Co. adjacent to their manufacturing facilities at 1000 First St., Wausau, Wisconsin. The new building has a total floor space of 6,000 square feet. It houses the company's general and executive offices and engineering department.

Data Offered in This Month's Ads

Readers may obtain any of these free reference materials by circling the corresponding numbers on the Reader Service Cards

1: Hold-down clamps with shielded screw are illustrated. **Adjustable Clamp Co.**

2: Stainless welding is featured. **Air Reduction Sales Co.**

3: Welder wheels are featured in catalog. **Air Reduction Sales Co., Tuffaloy Dept.**

4: Electrodes for joining, cutting and shaping are featured. **All-State Welding Alloys Co., Inc.**

5: Weld-cladding with electrodes and wire is featured. **Alloy Rods Co.**

6: Brazing Alloys are listed in catalog. **American Brazing Alloys Corp.**

7: Welder's clothes and safety equipment are featured. **American Optical Co.**

8: Resistance welding electrodes for high temperature use is the subject of a catalog. **Ampco Metal, Inc.**

9: X-ray roll film is featured in literature. **Ansco, Division of General Aniline & Film Corp.**

10: Removal of dust, smoke or fumes is featured in literature. **The Arcair Company.**

11: Hold-down clamps are featured. **Armstrong Bros. Tool Co.**

12: Hole saw kit is illustrated in Bulletin HS-475. **Armstrong Blum Mfg. Co.**

13: Resistance welding booklets are offered. **ASEA Electric, Inc.**

14: Iron worker for short runs is shown in literature. **Bateman Foundry & Machine.**

15: Carbon arc gouging is featured in material. **Becker Brothers Carbon Co.**

16: Power connectors are described in catalog. **Can-Lok Div., Empire Products, Inc.**

17: Oxide scale problems are discussed. **Chemclean Products Corp.**

18: Chipping hammers in seven styles are described in a bulletin. **Chicago Mfg. & Distributing Co.**

19: Clamps for all jobs are described in catalog. **Cincinnati Tool Co.**

20: A tong-type a.c.-d.c. ammeter is featured in material. **Columbia Electric Mfg.**

21: Pipe layout equipment is featured. **Contour Sales Corp.**

22: Portable X-ray units are featured. **Curtiss Wright Corp., Princeton Div.**

23: Radiographic inspection of hard to reach areas is featured. **Curtiss Wright Corp., Princeton Div.**

24: Eyeshield for chipping or welding is featured. **Dockson Corp.**

25: Electrode holders are featured. **Duro Engineering Co.**

26: X-ray film pack in rolls is described. **Eastman Kodak Co., X-ray Sales Div.**

27: Portable welder is featured. **Emerson Electric.**

28: Arc welding accessories and welding circuits are described. **Erico Products, Inc.**

29: Cast iron welding is the subject of literature. **Eutectic Welding Alloys Corp.**

30: Tungsten electrodes are featured. **General Electric Co., Lamp Metal & Components Dept.**

31: X-ray inspection equipment of a complete line is described. **General Electric Co., X-ray Dept.**

32: Non-destructive testing facilities are described in literature. **General Magnaplate Corp.**

33: X-ray film exposure calculators are available. **The Gevaert Company of America, Inc.**

34: Axle assemblies, jacks, couplers, and spindles are illustrated in a catalog. **Hammer Blow Tool Co.**

35: Hardening of wearing parts is featured. **Hard-N-Tuff Corp.**

36: Electrodes for all positions are described in Bulletin R-29. **Harnischfeger Corp.**

37: Gaugeless regulators are described. **Harris Calorific Co.**

38: Controlled flame cutting is described in literature. **Heath Engineering Co.**

39: Resistance welding alloys and tips are featured. **Hercules Welding Products.**

40: DC motor generator welder is featured in Bulletin DM-101. **Hobart Brothers.**

41: Metal workers in five sizes are described in literature. **Homestrand Machine Tool Corp.**

42: Iron bender with 147 dies is featured in a bulletin. **Hossfeld Mfg. Co.**

43: Welding helmets for all arc processes are illustrated. **Jackson Products.**

44: Manual arc welding accessories are featured. **Lenco, Inc.**

46: Welding distributors and how they serve local needs is described. **Linde Company.**

47: Magnetic ground clamp of aluminum construction is described in data. **Magne Cast Tool Co., Inc.**

48: Dye penetrant materials in spray cans are described. **Magnaflux Corp.**

49: Tip cleaners are featured in literature. **Maitlen and Benson, Inc.**

50: Industrial arc welder is described in data. **Metal & Thermit Corp.**

51: Galvanizing welds is the subject of information which includes a sample. **Metalloy Products Co.**

52: Wire gun and powder gun hard surfacing is featured. **Metco, Inc.**

53: Automation techniques and skilled technicians are among the facilities described in data. **Morgan Engineering Co.**

54: Electrodes, welding rods and wire are described in literature and a film. **National Cylinder Gas Division of Chemetron Corp.**

55: Welding wire comparison chart and color code identification card is available. **Page Steel and Wire Division, American Chain & Cable Co., Inc.**

56: Flaw hunting kit to find hidden surface flaws is featured. **Picker X-ray Corp.**

57: Leakproof hose connections are described in catalog. **Punch-Lok Co.**

58: Hardsurfacing information and prices are offered in bulletin. **Rankin Mfg. Co.**

59: Techniques for finding hidden defects are listed. **Picker X-ray Corp.**

60: Backing rings for pipe welding are featured. **Robvon Backing Ring Co.**

61: Weld cleaning is discussed. **G. W. Smith & Sons, Inc.**

62: Plug-in welder control units to add welding power are illustrated. **Square D Co.**

continued on page 84

Circle No. 15 on Reader Service Card.

BECKER

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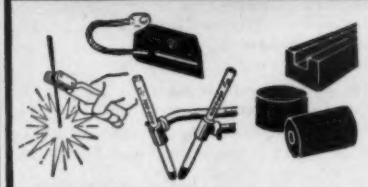

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FREE Send for informative brochure "Welding Hose Care & Repair".

In Canada: Fibre-Metal (Canada) Ltd., Toronto

Circle No. 71 on Reader Service Card.

DATA FEATURED IN ADS

continued from page 83

64: Electrodes for joint strength and wear resistance are described. **Stulz-Sickles Co.**

65: Miniature torches are described. **Tec Torch Co., Inc.**

66: Temperature indicating crayons are featured in literature. **Tempil Corp.**

67: Electrodes for resistance welding are listed in a catalog. **Tipaloy, Inc.**

68: Regulator-flow meter is described in literature. **Victor Equipment Co.**

69: Slotting-notching of pipe and tubing is described in literature. **Vogel Tool & Die Corp.**

70: Controls for brazing alloy flow are described in literature. **Wall Colmonoy.**

71: Manifolding cylinder pigtails are featured. **Western Enterprises, Inc.**

72: Film badge monitoring is featured. **X-Ray Monitoring Corp.**

73: Extra thin metal welder is featured in Bulletin ADI. **Hobart Brothers Co.**

74: Welding and cutting outfit is featured. **Linde Company.**

75: Weld inspection is the subject of literature. **Magnaflux Corp.**

76: Non-destructive testing is featured. **Picker X-Ray Corp.**

78: Recovery of used radiographic film is featured. **Handy & Harman.**

79: Non-destructive testing equipment is described and illustrated. **Philips Electronic Instruments.**

80: Carbide is featured in literature. **Shawinigan Products Corp.**

81: Pipewelding torch is featured in literature. **Smith Welding Eqpt. Corp.**

83: Arc spot weld gun is featured in literature. **Bren Weld Corp.**

84: All purpose welder is described in a data sheet. **Metal & Thermit Corp.**

85: DC rectifier welder is described in a data sheet. **Metal & Thermit Corp.**

86: Temperature indicating crayons are featured in colorful folder. **Curtiss Wright Corp., Princeton Div.**

87: Ultrasonic flaw detector is described in literature. **Curtiss Wright Corp., Princeton Div.**

88: AC-DC 3-phase input arc welder is featurde. **Vickers Inc.**

89: Temperature indicating crayons in adjustable metal holder is described in a brochure. **Markal Co.**

CLASSIFIED

Cost of all ads in this section is $20 for the first inch and $15 for each additional inch or fraction. Rates for display ads in this section will be sent on request. All classified advertising payable in advance.

WELDING TRAINING

Complete or brush up courses in oxy-acetylene welding & cutting, Manual Arc, TIG, Automatic, Pipe (up & downhill) sheet metal, etc. Precode test training. Request bulletin from—

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PHOTOS courtesy Michael J. Scilingo

CADDY TYPE K-35 (300 AMP) ELECTRODE HOLDER being used to weld angle iron stiffeners for reinforcing bottom of "STEELDOMES". Air hose coupling in center also tack welded.

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uses CADDY® ARC WELDING ACCESSORIES

CECO STEEL PRODUCTS CORPORATION, Chicago 50, Ill. is nationally known for their steel and aluminum windows, hollow-metal doors, steel forms, steel joists and roof decks, roofing products and accessories.

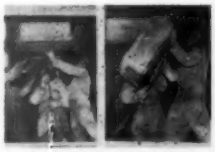
Illustrated here are sequence photos showing how CECO's "STEELDOME" CEILINGS are constructed. This particular installation is one of the Illinois Tri-State Tollway Restaurants.

CECO used complete CADDY ARCWELD CIRCUITS and K-35 (300 AMP) Electrode Holders for welding stiffeners in reinforcing the "STEELDOMES". Operators prefer the CADDY K-35 because of its coolness, while central maintenance claims CADDY's long trouble-free service drastically reduces holder downtime.

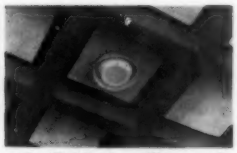
1. CECO's air-jet "STEELDOMES" being butt positioned on wooden runners prior to concrete pouring.

2. Steel reinforcing rods being laid around "STEELDOMES".

3. "STEELDOMES" coated with oil to assure clean smooth surface when removed. Note air-jet holes in centers.



4. Compressed air forces "STEELDOMES" away from dry cement (wooden runners already removed)



5. Finished ceiling with accoustical tile and lighting fixtures installed.

CADDY® Arc Welding Accessory Div.

Erico Products, Inc.

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